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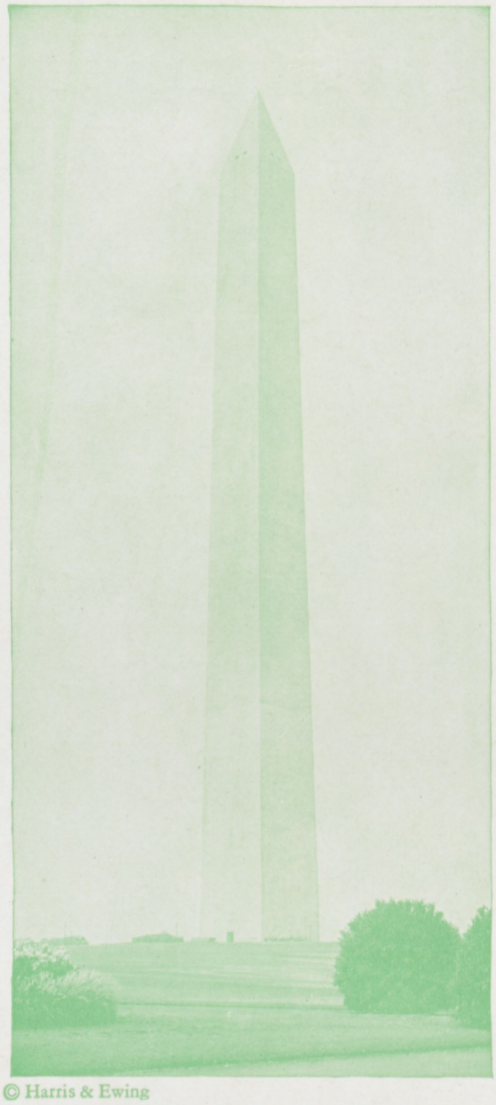
Uplift Applied To Monuments By Otis Elevators

THE Englishman confessed to his American friend whom he was conducting through the London Tower that never before had he visited that most historic building of his native city. It was always there; he could go any time. So he never did, until the insistent American prodded him into action.

Is it for a similar reason that so few college students in and around Boston visit the Bunker Hill Monument? Hardly: because they come from all parts of the country. Is it then another instance of indifference of college men? Not that either. College men in Washington generally ascend the Washington Monument.

No expert is needed to solve this puzzle. The ascent of the Bunker Hill Monument must be made on foot. It's a long, hard climb. But visitors to the Washington Monument are speedily and comfortably borne to the top in an Otis elevator.



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AMERICAN HISTORY

1799—December—Congress passed Resolution for erection of marble monument in memory of George Washington.

1833—Corner Stone laid—

1839—Work stopped—

1880—Work resumed—

1884—100 oz, pure aluminum cap stone set.

1884-1926 Over 5,000,000 people ascended to top of Monument.

ELEVATOR CHRONOLOGY

1879—Otis Steam Elevator, installed for use in construction work.

1884—This elevator converted to passenger use. Round trip 17 minutes. Passengers carried to the top of the monument during the life of the elevator, 1,279,719.

1901—Electric Elevator installed, having a round trip time of 10 minutes. Passengers carried up during its lifetime, 3,750,000.

1926—Otis Micro-Drive Gearless Traction Elevator installed, with a round trip time of 2 minutes. Will carry to the top of the monument an estimated number of 12,000,000 passengers in the same time as the life of its predecessor.

THE WORLD'S WORD FOR ELEVATOR SAFETY

OTIS ELEVATOR COMPANY

Offices in All Principal Cities of the World

THE ROSE · TECHNIC

PUBLISHED · MONTHLY · BY · THE · STUDENTS · AND · ALUMNI · OF · ROSE · POLYTECHNIC · INSTITUTE · · ·

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ROSE POLYTECHNIC BASKETBALL SQUAD, 1927

Rear row, left to right—Hoffman, manager; Thompson, Andy Nehf, assistant manager; Moore, Heze Clark, coach.

Second row, left to right—Alexander, Kasameyer, Lee Berry, captain; Goddard, Taggart.

Front row, left to right—Franzwa, Reinking, Adams, Sawyer.

The Cement Mill as a Load and Power Producer

Utilization of Waste Heat in Cement Manufacture

By J. H. Lendi,'97

Electrical Engineer, Universal Portland Cement Co.

A CEMENT MILL considered as a load is unique among industrial plants in that it operates at an exceptionally high load factor over a 24 hour day, any departure from 100% daily load factor being caused by incidental operating difficulties and not by essential interruptions in the process. Moreover this condition persists over weeks and months except as influenced by holidays.

In a year's operation the load factor is lowered because of a seasonal variation of demand for cement together with inadequate storage facilities for the finished product. On the other hand, increased storage capacity would improve the load factor, but storage bins are expensive and the correct cement storage capacity for any plant is a rather indeterminate economic problem, being influenced by weather and business conditions. It is therefore better left to intuition rather than to mathematical analysis, particularly because an annual load factor of 75%, usually attained, against a monthly factor of 80% which is about the highest that may be expected, leaves too small a margin for exact analysis with indeterminate factors.

Not only is the rate of energy used uniform but also the consumption of energy is large, as may be realized when we consider that during the year 1926 the cement industry of the United States consumed more than 1,500,000,000 KWH, the equivalent of 2½% of the electric energy generated by all Light and Power utilities. As an illustration of this remarkable load condition a typical daily load diagram taken from actual operations, indicates a load factor of 89% corresponding to an average consumption of 4700 KWH. Figure 2 shows similar data over 12 months

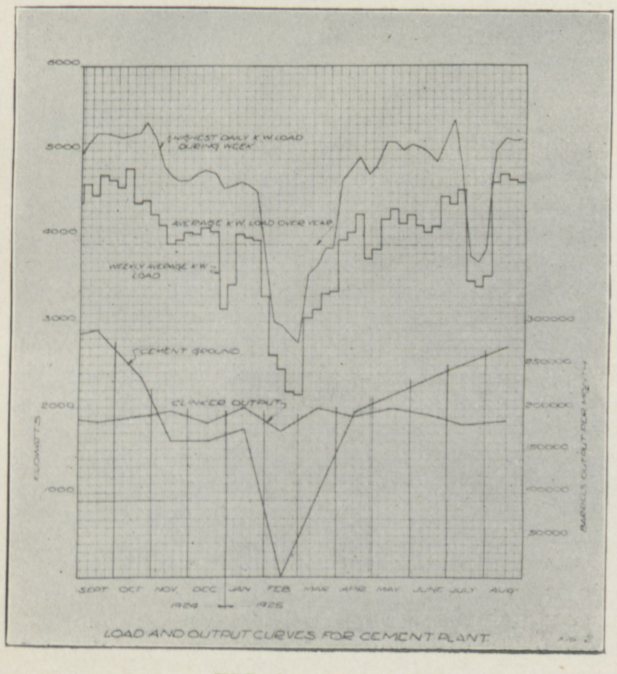


FIG. 2

operation by weeks in relation to the highest daily load as well as output of the two principal departments, that is, clinker production and finished grinding, and shows definitely the influence of seasonal demand for cement on power demand. The load factor over the year as measured by the two highest average daily kilowatt demands against the average kilowatt load over the year is, in this case, over 71%. A load of this sort at 80% power factor is therefore very desirable from the standpoint of the power seller. Unfortunately for him, however, the cement mill has the ability to furnish its own power as will appear later.

In order that we may visualize the operations that result in such load characteristics we shall describe in general the functions of the various departments of a cement mill from the raw material to the finished cement in the stock house.

Two raw materials enter as ingredients of Portland Cement:—Limestone, furnishing the base ultimately in the form of CaO, and some form of Aluminum Silicate, such as blast furnace slag, clay or shale, as the acid component. The mills of the Universal Portland Cement Co. make use of the by-product of the blast furnace for the silicious component. Practically all other mills in the U. S. use clay or shale instead of slag but the process is essentially the same and we may therefore describe the operation of one of the Universal Portland Cement Co. mills as a typical dry process plant.

Starting with the limestone bins, stone is delivered to a crusher where it is reduced to 1½ inch size or less after which it is dried preliminary to further reduction in size to about 90% through a 20 mesh sieve, thence to the proportioning and weighing machine where it meets the ground slag that has gone through practically the same operations; the two constituents are combined in the approximate proportions of 2 to 1 respectively. The exact ratio is of course determined by the chemical analysis of the raw materials. The mixture of the two ingredients is then ground together in tube mills to a fineness of about 95% through a 100 mesh sieve and the product is known as Raw Mix.

Coincident with these operations we have the preparation of an incidental raw material:—powdered coal—for drying and burning of the raw materials. Here again the cement industry bears a distinction in that it is the pioneer in the use of this type of fuel. Powdered coal was long ago standard practice where oil or gas was not available and that is in over 90% of the cement mills of the United States.

Due to the type of furnace and chemical nature of the process it is essential that the coal be ground somewhat finer than is probably necessary in boiler practice, for the reason that should the coal come in contact with the raw material before the combustion is complete there is a possibility of contamination of

the product with sulphur that would affect essential qualities of the cement.

Returning now to the raw mix which we may assume has been delivered to the Kilns during our digression on fuel. The operations taking place in the Kiln being essentially of a chemical nature, converting the chemically inert material to the active, versatile compound Cement, deserve special treatment, but suffice it to say that after traversing the kiln the finely powdered raw mix has undergone another transformation in that it is now in the same physical condition as when the raw material started, namely 1½ inch size and under, and much harder than the raw materials. This product is technically known as cement clinker. To make the final product, cement, it is again necessary to repeat the grinding operations which require the expenditure of 7 kilowatt hours per barrel additional to 10 kilowatt hours which have already been used, including all incidental power uses, before the raw mix became clinker, making a total of 17 kilowatt hours per barrel of cement.

At this point the reason for the high load factor is apparent. The process of burning being essentially continuous, requires therefore, continuous preparation of raw material, together with the fact that the final grinding of both raw material and cement in tube mills, constituting about half the load, suffers very little interruption in operation due to the simplicity of the type of grinding unit.

FUEL

The average amount of fuel to burn clinker in about 50 dry process cement mills amounts to 1,400,000 B. T. U.'s per barrel of cement, the variation from this average is only 200,000 B. T. U.'s It will be seen that the process of burning is reduced to a fairly uniform practice. In some cases there is a much better fuel practice but this is due to a great extent to a difference in the nature of the raw materials.

It would seem therefore that with such a uniform fuel practice that the present type of rotary kiln is worked at about the maximum efficiency of which it is capable, and yet we have to face the fact that only about 400,000 B. T. U.'s are required to actually bring about the necessary chemical reactions. Confining ourselves to our own practice we show herewith a heat balance diagram of a typical kiln in our plants. Figure 4. Even here with a fuel practice of 900,000 B. T. U.'s per barrel, 55% of the heat is rejected by the kiln. In order to see that this apparently poor showing is not altogether a matter of faulty design or operation it is necessary to analyze the various functions of the Kiln. Consider now Figure 5 showing diagramatically the phenomena taking place in a rotary kiln. Following the course of the raw material:—We have the material entering at the right into a cylindrical brick lined rotating shell slightly inclined so that during rotation the material progresses to the left, continually presenting a fresh surface which is heated by the hot gases of combustion from the powdered coal flame at the left end of the kiln.

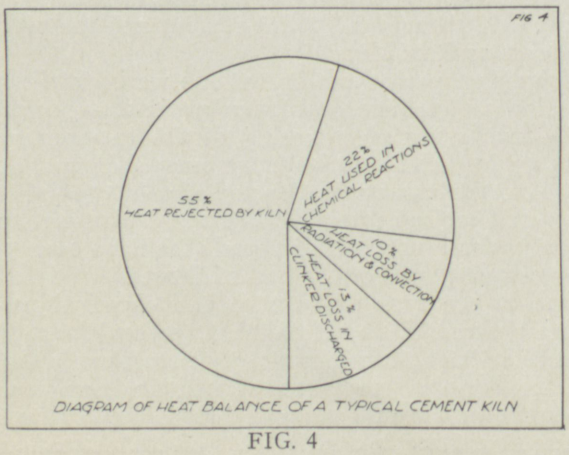


FIG. 4

The raw material in its course through the kiln undergoes a series of changes, namely:—

(a) Preheating and driving off water.
(b) Decomposition of limestone to CaO.
(c) Decomposing sulphur compounds that enter as an impurity of the raw material, and essentially, a partial fusion of the raw mix to bring about the chemical reactions resulting in the cement clinker at a temperature of about 2600 degrees Fahr.
(d) A preheating of combustion air more or less effectively cooling the clinker to about 2100 degrees Fahr.

Let us next consider the agency by which these chemical reactions are brought about, by starting at the left end of the kiln.

Neglecting for the present the preheating of combustion air which in the present kiln is a matter of accidental design rather than a preconceived idea worked out to its full possibilities, we shall describe the primary function of the cement kiln, that is, to bring a properly prepared and proportioned mixture of Lime, Silica and Alumina to a point of fusion in order that the proper Calcium Silicates and Aluminates may be formed. Now, inasmuch as this reaction is exothermic, there is more heat leaving the fusion zone than enters (how much more is not definitely known) so that, so far as this function of the kiln is concerned, the only heat required is that necessary to raise the temperature of the material to a point of fusion, namely, 2600 degrees, while the hot gases in passing onward serve to heat the raw material preliminary to the fusion and serves further in decomposing the Limestone of $CaCO_3$ to CaO, the only necessary chemical reaction absorbing heat other than decomposition of sulphur compound which is incidental.

The gases of combustion and decomposition must necessarily be disposed of and it would seem that so long as the temperature of gases leaving the kiln is in excess of the temperature of the raw material entering the kiln that we have neglected to use the available heat which could possibly be saved by adding indefinitely to the length of the kiln. Such reasoning is faulty for the simple reason that a definite amount of fuel must be burned in order to maintain the temperature of the fusion zone in a given case and if the resulting heat is more than sufficient to preheat and decompose the raw materials there is nothing for the excess heat to do but be rejected in the kiln gases.

There is therefore with the present type of kiln of given diameter and kind of fuel a certain length beyond which there will be no fuel economy and any heat rejected must be charged to the inherent inefficiency of the process and is therefore not subject to improvement by design. Whatever this optimum length of kiln may be it is safe to say, in view of operating statistics of a considerable range of kiln sizes, that there will always be sufficient heat rejected to merit serious consideration. This being the case we may consider the rejected heat as a necessary by-product and recover its energy by means of the so-called waste heat boiler, and it may not then be so desirable to achieve such high economy in the kiln.

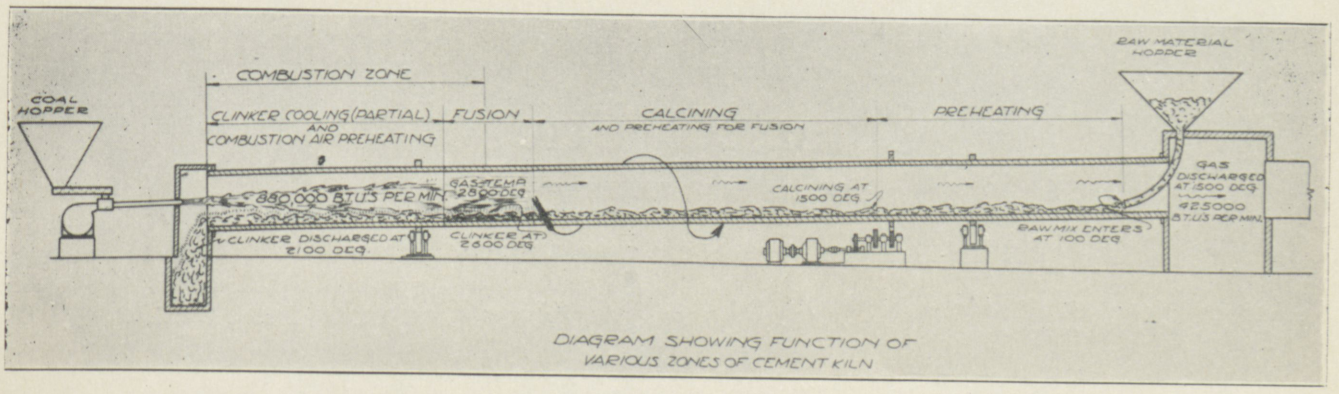


FIG. 5

Due to efficient operation and nature of raw materials the mills of Universal Portland Co. produce one barrel of clinker for every 900,000 B. T. U.'s burned in the kiln and with 55% of this rejected we recover sufficient energy to operate the mill to which waste heat boilers are applied, a very desirable state of affairs.

The waste heat boiler equipment considered as a legitimate adjunct of the cement kiln therefore changes the economic problem completely.

As might be expected, the application of the waste heat boiler to the cement kiln meets with a number of new difficulties never before encountered by a boiler.

The gases issuing from the kiln are accompanied with a considerable amount of dust and in our particular case this dust is of abrasive nature. It was but a short time before it was discovered at our Mill No. 6 that a high gas velocity, resulting in high heat transfer rate and therefore low first cost of boiler, and a gas containing a highly abrasive dust constitute an incompatible condition in that tube replacement almost became one of the principal activities of the mill. Happily this is now history and in spite of the handicaps that penalize every pioneer, this installation is now performing comparable with any of the later ones.

Among the lessons that were learned are:—

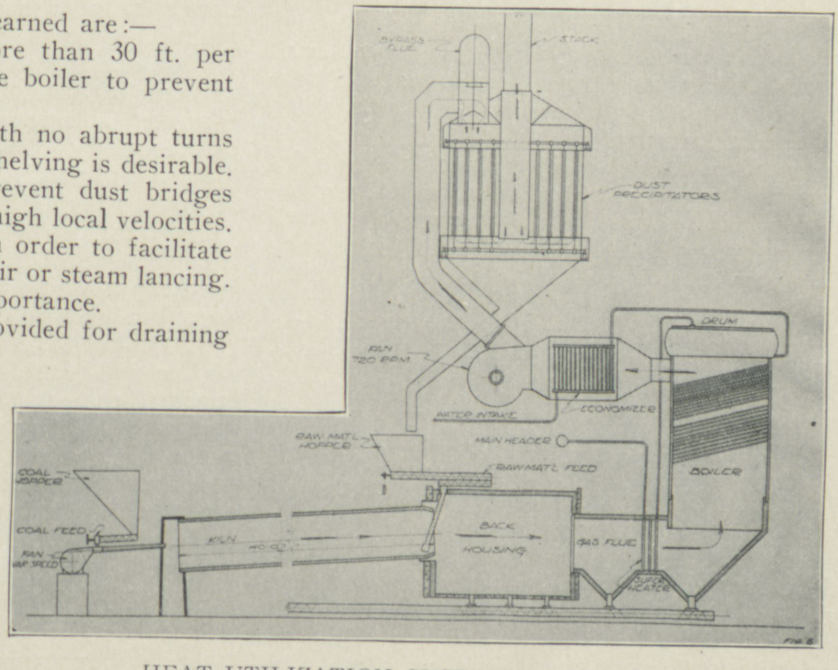
(a) Low gas velocity, not more than 30 ft. per second at any point in the boiler to prevent tube cutting.
(b) A uniform gas passage with no abrupt turns and little or no horizontal shelving is desirable.
(c) Liberal tube spacing to prevent dust bridges from forming and causing high local velocities.
(d) Accessibility to all parts in order to facilitate easy cleaning by means of air or steam lancing.
(e) A steel casing is of first importance.
(f) Ample means should be provided for draining dust lodging in the boiler.

The extreme limit of 30 ft. per second gas velocity to prevent abrasion is established particularly where there is a component of velocity at right angles to the boiler tube, a condition unavoidable in any water tube boiler. It was verified that where the gas flow is parallel to the tube no cutting took place even at 60 ft. per second and all abrasion was confined to those locations where the gas flow turns to enter the following pass, that is, where there is a flow against the boiler tube.

It would seem that a fire tube type of boiler with tubes vertically disposed would be ideal in this respect. A preliminary experiment of this nature is now being made but no data is yet available. The question to determine in the fire tube boiler is how high a gas velocity is permissible even though the gas flow as a whole is parallel to the tube, for we must realize that in order to attain a reasonable heat transfer rate, that is, a reasonable size of boiler, requires a gas velocity sufficiently high as to cause turbulent flow, and such a flow has a velocity component against the tube wall.

The second item as to uniform gas passage follows as a consequence of what has been said concerning gas velocity, because horizontally disposed parts in the gas passage generally form inaccessible pockets for the accumulation of dust, ultimately building up, causing high local velocities and therefore cutting. Again in some types of boiler where brick baffling is used between spaces of high differential pressure, the difficulty of making a tight baffling causes short circuiting of gases and cutting in the interstices, even though

(Continued on page 26)



HEAT UTILIZATION SYSTEM AS PRACTICED BY THE UNIVERSAL PORTLAND CEMENT COMPANY

Old and New Methods of Constructing Concrete Bridges

By J. B. Hunley,'03

Engineer Bridges and Structures, C. C. C. & St. L. Ry., Cincinnati, Ohio

Abstracted from Proceedings American Concrete Institute
By J. B. Wilson, c.,'27

THE C. C. C. & ST. L. RY. abandoned the use of stone masonry for bridge construction 25 years ago, and although some concrete was placed in the early nineties, it was not used to any great extent until 1902, at which time there was inaugurated a comprehensive program of reconstruction and extension of lines, which has since been carried on from year to year, almost uninterruptedly.

The first thing in the way of a specification extant is a typewritten sheet covering the construction of a fourteen foot arch in 1898. The mixes only are specified, and are as follows:

FOOTINGS—One part Louisville cement, 2 parts sand, 5 parts gravel.

ABUTMENTS AND WINGS—One part portland cement, (Buckeye or Alpha), 2½ parts sand, 6 parts screened gravel or broken stone.

ARCH RING—One part Alsen cement, 2 parts sand, 5 parts clean, screened limestone chips.

PARAPET WALLS—One part Alsen portland cement, 2 parts sand, 6 parts stone.

The first General Specification was issued in 1902, entitled: "Specifications for Concrete Monolithic Construction." It established a proportion of 1:2:4 where natural cement was used in foundations, and for portland cement concrete the proportions were 1:2½:5 for piers and abutments, 1:2½:4 for arch rings and girders, and in especial cases where maximum strength was not needed, 1:3:6, and contained this clause: "It is understood that the proportions of stone and gravel are approximate and may vary with the character of the materials, and must always be such that the mortar will fill all the interstices in the stone when rammed," and as to placing:

"The concrete shall be put in layers at right angles to the direction of pressure in the structure, not exceeding 6 in. in thickness and thoroughly rammed with iron rammers, and shall be of such consistency that the water shall just flush to the surface when rammed."

The use of natural cement was discontinued in 1904, and a new specification was issued in 1905, in which wetter mixtures were advocated. The proportions were arbitrarily fixed, and the use of a premixed aggregate was permitted. The specifications were again revised in 1910. The specifications for cement was revised, and that for aggregates slightly modified, but that portion referring to consistency was unchanged.

The use of the tower and chute came into quite general use, in which the mixes became still wetter, if possible, and the specifications of 1915 were quite fashionable in requiring that: "The concrete shall be a wet mixture of such consistency that it will flow freely on a slope of 4 horizontal to 1 vertical. It shall be spaded down and leveled, causing the water to rise freely to the surface, but not materially above it."

All of these specifications were in line with general practice, but the results were not entirely satisfactory. When any of the concrete began, after a few years, to show signs of deterioration, the trouble was usually ascribed to frost action, but in many instances it was found that the structure had been built in the most favorable weather. Of course we now know that most of it was poured too wet, as was customary, but at that time this was ignored, and suspicion was diverted to ingredients, and their proportions.

In 1919 the Structural Materials Research Laboratroy of Lewis Institute issued a bulletin on "Design of Concrete Mixtures", by Professor D. A. Abrams. This information was particularly interesting, as it contained a sort of promise, that, if we would break every rule of our specifications which referred to mixing, we might expect, with some certainty, a concrete of predetermined strength and uniform quality. It, of course, advocated the use of a minimum amount of mixing water, and offered a means of grading and proportioning the aggregates, which, if practical, would overcome one of our greatest difficulties.

In an endeavor to accomplish something, the specifications were revised in 1921 with this clause as to consistency:

"The concrete shall be of such consistency, as, and shall contain no more water than is necessary to permit of proper working. It shall be spaded down, leveled, and tamped, causing the water to rise on the surface. If water accumulates on the surface of the concrete, the amount of water used in the mix shall be reduced."

It seemed unwise at that time to make any change as to the aggregates. They were, in nearly every case, furnished by the railway company, and it was thought that a better grading might be arranged for at the pits and the proportions of sand and stone varied on each job, as might be found necessary.

In the fall of 1922 work was begun on a relocation of line and grade revision near Sidney, Ohio, which involved the construction of about 55,000 cu. yd. of concrete masonry, and although but little was known as to the application of laboratory theories to field practice, it was felt that it was a good time and place to experiment with the methods of proportioning concrete, as outlined by Professor Abrams, and it was so arranged.

Desired strengths, as shown below, were selected for various parts of the structure.

Footings	2000 lbs. per sq. in.
Piers and Abutments	2000 lbs. per sq. in.
Arch Rings	3000 lbs. per sq. in.
Spandrel arches & superstructure	2500 lbs. per sq. in.

In the footings, piers, and abutments, below the haunches, a pre-mixed aggregate was used of size 0 to ½ in. The fineness modulus varied from 5.3 to 6.7. It was found with this material, to avoid clogging by the shutes, an average consistency, as represented by a slump of 6 to 7 in. was required.

For arch rings and superstructure separate aggregates were used; washed sand 0 to ¼ in., and crushed boulders ⅜ in. to 1½ in.

The fineness modulus of the fine and coarse aggregates were quite uniform, averaging 3.2 and 7.8 respectively. The sand and stone were mixed so as to give a fineness modulus of the mixture varying from 5.7 to 6.0.

The average slump of some 300 samples was 3½ in. The concrete was mixed for a minimum time of 1 minute.

The concrete was conveyed to the forms by means of a tower 140 ft. high, and chutes having a pitch of 3 and 2½ horizontal to 1 vertical, and with these slopes the dry mixtures were handled without clogging or segregation.

The surface of the finished concrete is of excellent quality, and of the many thousand sq. yds. of area there probably was not more than 1 sq. yd. of honeycomb. No rubbing of any kind has been permitted, except at the ends of the arch rings, where the board marks were partially rubbed out.

Experiments had clearly indicated that by regulating the mix, the consistency, and the grading of the aggregate, a concrete of predetermined strength could be produced in the laboratory, but there was some question as to whether, by means of the crude facilities for control at hand, approximately similar results could be obtained under field conditions. As a check 6 by 12-inch test specimens were made from time to time, in accordance with the A. S. T. M. Standards, except that samples were drawn direct from the discharge of the mixer instead of from the forms, so that the actual slump of the particular batch could be determined.

Following are the weighted averages of some 280 tests, with various slumps and fineness moduli.

The batches were of regular run, with no refined proportioning or measurement such as would occur in the laboratory. In many cases it is known that the amount of cement varied between batches as much as 10%; as in some of the mixes, for instance, where 5½ sacks were required 5 sacks would be used in one batch and 6 in the next. The test cylinders were stored out of doors and were subject to all the variations in temperature, and considering the comparatively crude methods employed, it is not surprising that there was a considerable variation in the strength of the individual specimens from the expected strength. When a number of results are grouped and the averages taken, the strengths closely approximate those expected, and are probably quite representative of the concret in the structure.

We have frequently been asked if the application of these methods does not result in the use of more cement. It is true that we used in this work a little more cement than our old specifications would have required, but we are getting, we believe, not only a stronger concrete, but greater strength per barrel of cement.

Under the usual specifications there would have been placed about 10,400 cu. yd. mixed in proportion of 1:3:6, and 17,600 cu. yd. of 1:2:4 concrete. The F. M. of the mixed aggregate for both classes would have been about 6.25, and as usually mixed the concrete would have had a slump of at least 7 in. The True Mix for the 1:3:6 concrete would be 1:6.46, with an expected strength of 1350 lbs. per sq. in., and there would have been used 1.05 bbl. of cement per cu. yd. of this concrete. For the 1:2:4 mixture the equivalent. True Mix would be 1:4.3 with an expected strength of 2150 lbs. per sq. in., and there would have been used 1.48 bbl. per yd. The total net amount of cement used then would have been 36,970 bbl. With the fixed proportions of sand and stone, the mixed aggregate would have been too coarse to get a good finish, especially on the 1:3:6 concrete and the inspector would probably have used some excess cement, but this will be neglected.

For the purpose of comparison, let up multiply the strength in tons per sq. in. by the cu. yd. of this strength and call this the "yd.-tons". Then we would have had in the structure 25,940 yd.-tons, or about .7 yd.-tons per bbl. of cement.

As actually constructed, we have, using 41,670 bbl. of cement:

7,700	cu. yd. of 3000 lb. concrete	or	11,550 yd. tons
9,900	cu. yd. of 2500 lb. concrete	or	12,375 yd. tons
10,400	cu. yd. of 2000 lb. concrete,	or	10,400 yd. tons
28,000	cu. yd.		34,325 yd. tons

or 0.82 yd. tons per bbl. of cement. There has been no deduction made in the quantity of the cement for concrete spilled and wasted, and the strengths shown above are the designed strengths. As a matter of fact the 2500 and 3000 lb. mixtures were overdesigned about 5 percent. This correction gives us about 0.85 yd. tons per barrel.

Had we been satisfied with 1350 lb. and 2150 lb. concrete which would have presumably been obtained under the arbitrary specification and mixed the concrete by the same methods and slumps actually used, the True Mix for the 1350 lb. concrete would have been about 1:7.5, requiring 0.91 bbl. of cement to the yd. of concrete, and for the 2150 lb. concrete the true mix would have been 1:5.6, requiring 1.20 bbl. of cement per yd., or a total of 30,580 bbl. The yd. tons would be as before, 25,940, or 0.85 yd. tons per bbl., as was actually obtained in the structure.

It is apparent that about 6400 bbl. or 17.3 per cent of the cement would have been saved, at the same time obtaining concrete of equal strength, by simply

(Continued on page 28)

SLUMPS

2 to 2¾		3 to 3¾ in.		4 to 4¾ in.		5 to 5¾ in.		6 to 8 in.	
Expected Strength	3080	Expected Strength	3063	Expected Strength	2840	Expected Strength	2870	Expected Strength	2840
Actual Strength	2950	Actual Strength	2980	Actual Strength	3215	Actual Strength	3520	Actual Strength	2203

John Harvey Leads in Annual Contest of Rifle Teams at Rose

By Baird West

THE Rose Polytechnic Institute Reserve Officers' Training Corps Rifle team has completed its annual match against all other similar units in Indiana, Ohio, West Virginia and Kentucky. The match has been quietly progressing at the Engineering Institute since January 1.

This match, in which Rose Poly is experiencing its third year, is known as the Fifth Corps area intercollegiate indoor rifle match. A silver trophy is offered to the best team representing all colleges in the aforementioned states having R. O. T. C. units. When any one college wins the trophy three times in succession that school becomes permanent possessor. An advantage was afforded Rose Poly unit this year when they received a shipment of ten new Springfield caliber .22 rifles of the latest model direct from the factory. This make of rifle is the best now in existence and undoubtedly proved a factor in improving the team score this year.

In choosing 15 men for the rifle team of 10 men a trial match was held previous to the one just finished which was open to all students of military training who had had previous experience. The 15 high men in that match decided the 15 men from which to choose the present 10. This group was then given special coaching by Warrant Officer Kearns before the start of the recent match.

Held in Four Groups

The match was divided into four groups of firing called stages, and each member of the team of 15 was required to fire in each stage. The first stage was 10 shots sitting and 10 shots prone, the second stage was 10 shots kneeling and 10 shots prone, the third stage was 10 shots standing, and 10 shots prone, and the fourth stage was 20 shots prone.. All the firing was done on the indoor .22 calibre range in the basement of the main building of Rose Poly. Bull's-eyes five-sixteenths inches in diameter were fired from a distance of 50 feet.

The targets are collected for each member's firing and are sent into the headquarters of the Fifth Corps area, where they are totalled along with those from the other schools. The possible score for each separate target is 100 points, and the possible total is 800 points. The highest ten scores in each stage are selected as the representative score for that stage, and these are the ones which go to make the grand team total. To check all of the targets requires some time, and it is not expected to know the winning team before March 15.

This is the third year that the Rose unit has participated in this match and it is interesting to note the improvement in the team scores since Rose first entered the match. The team score in 1924 was 6,278 out of a possible 8,000; in 1926 it was 7,385, or a gain of 1,107 points; and this year the team score is 7,476, or a gain of 91 points over last year's score. Last year Rose Roly was in ninth place, but with a better score this year it is hoped to place much higher. With individual training progressing next year should find the Rose unit having a "leg" on the trophy.

Harvey Scores 770

The team members with their total scores are shown below. The total possible score per man is 800:

1.	John Harvey	770
2.	Norman Traub	762
3.	Fred Mischler	753
4.	Edgar White	749
5.	Roger Mace	746
6.	Guy Mahan	743
7.	Richard Kadel	741
8.	Kenneth Metcalf	736
9.	John Mendenhall	731
10.	Frank Crawford	720
11.	Lee Akers	720
12.	Roy Reece	704
13.	Baird West	685
14.	Galen Clark	681
15.	Charles Barbre	656

The score for the high man in the general match last year was 755, against Harvey's score of 770 this year.

The military department of Rose Poly is awarding medals and shield to the men this year, which factor was a reason for the increase in competition among the local men. The gold medal will be awarded to John Harvey for first place; the silver medal to Norman Traub for second place, and the bronze medal to Fred Mischler for third place. These will be presented at an assembly in the near future. In addition, the ten high men will be awarded a marksmanship shield, which will be worn on the left sleeve of the uniform. In the event of a tie between Frank Crawford and Lee Akers, ranking 10th and 11th, respectively, each man will be awarded a shield.

Steps have been taken by the student Athletic Board for the recognition of shooting as minor sport, with suitable awards for team members each year. The next event on the Rose Tech shooting program will be firing of the calibre .30 Regular Army rifles on the new Rose outdoor range, which will be opened for the first time late this Spring. Shooting at Rose Poly is under the supervision of Lieut. W. W. Bessell and Warrant Officer Kearns. Too much credit cannot be given to Mr. Kearns for the increase in the scores made possible by his coaching of each individual member of the team. Mr. Kearns has won distinction with both the rifle and pistol, having won both the distinguished sharpshooter medals with each firearm. He was the winner of the annual match staged by the Illinois Rifle Association at Chicago last Fall and is now in possession of the historic trophy.

Commercial Aviation in the United States

Developments of this Increasingly Important Carrier

By Wendell A. Watkins, e.,'28

JUST as in the automobile industry the names of Henry Ford and other prominent manufacturers stand out, so it is in aviation. The name "Stout" is closely linked with commercial aviation.

William Stout was born near Qunicy, Illinois in 1880. He graduated from Hamline University in Minnesota with the degree of Mechanical Engineer and in time became chief engineer of the Packard Motor Company's aviation division. Shortly after this war was declared and Stout was chosen as technical advisor of the Aircraft Board formed under Henry Coffin.

Mr. Stout conceived the idea of making airplanes with thick wings and in his first attempt constructed one that cost $40,000 without the motor. The only objection to a plane of this type was that the wood and glue used in its construction could not withstand extreme changes in weather. Accordingly, he decided to construct a plane of metal, choosing duraluminum, a copper-aluminium alloy, sheets of which when corrugated proved to be almost as strong as cold-rolled steel and only one-third as heavy. He contracted with the Navy Department to build three airplanes of the all-metal type for $50,000 each, but being inexperienced in manufacturing metal planes, spent $150,000 in building the first one. The two remaining planes were under construction but were confiscated along with his machinery as part payment of the unfulfilled contract.

Mr. Stout and his associates, now being without capital, interested several outsiders, among whom was Edsel Ford, in financing a new company. The new men furnished enough capital that two planes could be built and put into service carrying passengers and baggage. However, seeing that the new company was making little progress, Stout wrote to Ford telling him of the plans he had made for commercial aviation. He heard nothing from Ford until three months later when he received a letter calling him to Dearborn to select a site for a flying field. He helped to select the flying field and drew up plans for a factory which was built and ready for operation in ninety days.

Stout, in the meantime, was in Detroit learning more and more about the manufacture of all-metal planes. Again Ford sent for him, this time announcing two facts: He wanted airways established between Detroit and Chicago, and Detroit and Cleveland. He wanted, moreover, to buy the Stout Airplane Company at double its value and retain Stout as manager.

The stockholders of Stout's old company, not wishing to give up their holdings entirely, formed a new company into which each of the 120 men put $1,000. The new company became the "Stout Airplane Services" and is at present carrying out its purpose to instruct industrial concerns in the operation of private airways, train their pilots, and manage the airway until the owners are provided with the trained personnel necessary to assume the responsibilities of the project. The company has played a great part in the advancement of commercial aviation and has become quite powerful.

Fords Take Part

The Fords have not been idle in the advancement in this new field. Their efforts include developments along many lines, all of which may be summarized as follows:

They have built and equipped a 260-acre flying field for public use.

They are erecting the largest dirigible mooring mast in the world.

They are financially supporting the Stout Airplane Company and the Aircraft Development Company, the former manufacturing all-metal planes and the latter metal-clad dirigibles for commercial purposes.

They are offering use of the organization of Ford representatives in the sale of the products of the above companies.

They are making preparations for the production of airplane motors in their own plants.

They are devoting part of their engineering force

Boeing Plane Using Curtis D-12 Engine

A small speedy plane developed during the war

and facilities at the new Dearborn laboratory to experimental work in aviation problems.

They are cooperating with the leading authorities in the industry.

They have declared their intention of helping to make Detroit the center of aircraft industry.

A Typical "Ford" Plane

Edsel Ford is in charge of the Ford interests and is already working on the safety factor of airplane construction. He has been experimenting with a plane that is 22 feet wide, 15 feet long, weighing only 350 pounds, and is driven by a 25-H.P. engine equipped with a muffler which makes it virtually soundless while traveling at a rate of 90 miles per hour.

One of the planes being turned out at the Stout branch of the Ford Motor Company is a multiple-engine plane which makes a great step towards safety. Equipped with three Wright motors, it weighs two tons and will carry 1500 pounds of freight. The motors are arranged and powered so highly that any two of the engines will carry the plane without loss of height, and the remaining motor will carry the plane sufficient distance to make a safe landing. The three-engine type plane sells for $37,500, while the single-engine plane sells for $22,500.

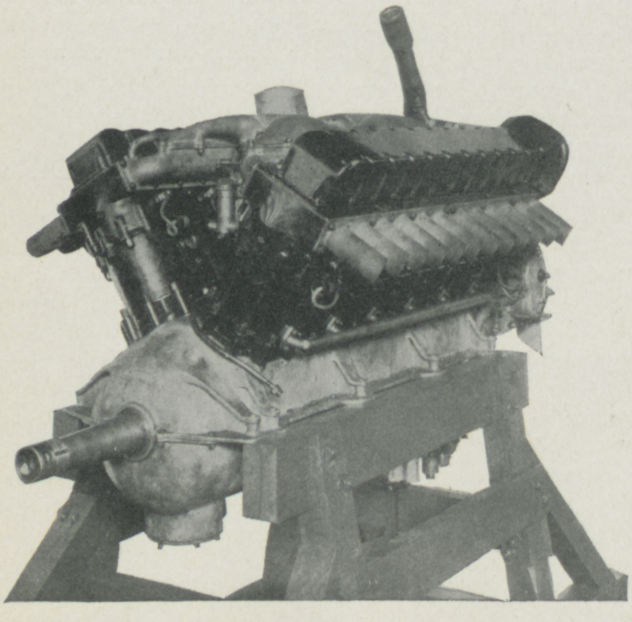
Mr. Stout says that aviation will develop in three stages: first, by fuller utilization of the plane in business and industry; second, by use of it for passengers; third, by adaption of airplanes to individual ownership when planes can be obtained at a lower price. He says that we are in the first stage at present and that the planes to be used in the second stage will be large enough to carry twenty passengers and one ton of freight. They will be driven by five or six large air-cooled motors that will be capable of making one hundred miles an hour.

Acording to Mr. Stout, the plane will later be used by private owners for pleasure or business trips between cities, but it will never be developed to the extent that one will drive to town to shop or visit a friend.

The Grand Rapids Press states that the small plane will be a thing of the future.

"A general hope will be that the Ford Motor Company sticks to the great crusiers until the factor of risk in airplane handling has been reduced considerably below that which now prevails. Their cost—$37,000—is a better protector to the public than any law. No person is going to invest $37,500 in a plane without assurance that he is going to put it in the hands of a reliable pilot. Granting the mechanical triumph of such an achievement, a sturdy little Ford plane, put on the market say, at $498, fully equipped with a standard gear shift and balloon tires, would be a national menace. The longer American aviation remains in the hands of the private pleasure adventurer, the better all around."

A U. S. ARMY REGULATION (SEAT PACK) PARACHUTE



CURTIS D-12 ENGINE (509 H. P.)

Air Commerce Act Passed

In August of 1926, the Air Commerce Act was passed, recognizing aviation as a business proposition and giving it government control and regulation. Under the Commerce Act, the department may list, map and encourage the development of airways and landing fields, and examine and register aircraft.

Friday, August 18, 1926, President Coolidge approved two flying routes recommend by Secretary Hoover that will eventually make a vast network of national airways. One is the Transcontinental route operated by the Air Mail Service of the Post Office

(Continued on page 20)

EDITORIAL

*Metric Standarization—A Timely Issue**

ONE of the greatest economic opportunities before the United States today is in the adoption of the decimal metric weights and measures in merchandising.

The metric standards are the world's greatest practical success in weights and measures. They are practical because precise and unvarying, uniform throughout the world. They are a monumental success, for since James Watt in 1783 announced the plan on which the decimal units are based, nation after nation has advanced to the metric measures in merchandising—so that now more than 800,000,000 of the world's people employ these simple, understandable metric measures.

The impractical clutter of weights and measures to which we of the United States cling at this late date is a relic of barbarism—no nation has ever adopted such a jumble; scores of nations have abandoned similar jumbles for the metric measures. In the words of Andrew Carnegie, "Our present weights and measures are unworthy an intelligent nation today. We shall inevitably adopt the metric system."

High Points of the System

Based on the decimal system, like United States currency, the metric units are inter-related logically. Exactly like the dollar, the meter and liter and gram may be decimally divided or decimally multiplied. By simply shifting the decimal point one can at once achieve multiplication or division. It is automatic. We may use the same terms to express meters, liters, and grams, and their parts, as we do to express dollars and parts of dollars. For instance, 1.111 is expressed as one dollar, one dime (dec-ime), one cent, one mill. So also 1.111 is expressed as one meter, one dec-i-meter, one cent-i-meter, one mill-i-meter. And likewise with divisions of liters and grams.

If binary subdivision of metric units is desired, there is nothing to prevent the use of binary subdivision side by side with decimals. All the binary divisions, such as one-half and one-fourth, admit of precise decimal equivalents, familiar to our people through decimal currency.

That the metric system is the best practical system ever evolved is attested by this country's foremost authorities on weights and measures—the officials of the United States Bureau of Standards. Time after time they have testified to the vast superiority of the metric measures.

* An abstract from "The Metric Advance."

Analogy Between Metric Units and Those Now in Use

There is a close analogy in size between the metric units usually employed in merchandising and the obsolescent units now employed. Our language, already so rich in synonyms, will welcome these decimal units as the world yard, world quart, and world pound—alternative names for meter, liter, and 500 grams.

Our old yard will simply be advanced about 10 per cent to the meter, or world yard; our old pound avoirdupois will be advanced about 10 per cent to the 500-grams weight, or world pound; our old liquid quart will be advanced about 5 per cent to the liter, of world quart.

Need for Metric Adoption for Our World Trade

One of the most urgent reasons for adoption of metric measures by the United States is the need for our standards to conform with those of the world.

As has been pointed out, all the civilized nations, with the exception of the United States and the British Commonwealths, are already on the metric basis in merchandising. Their total population is over 800,000,000. Among the countries on the metric basis are France, Italy, Russia, Poland, Japan, Belgium, Netherlands, Spain, Portugal, Switzerland, Sweden, Norway, Denmark, Austria, Hungary, Czechoslovakia, Yugo-Slavia, Rumania, Finland, Lithuana, Latvia, Esthonia, Mexico, Argentina, Uruguay, Chile, Brazil, Peru, Venezuela, Paraguay, Columbia, Ecuador, Bolivia, Guatemala, Honduras, Algeria, Germany, Persia, Siam, Netherlands Indies, Philippines—and more than 100 other countries. Besides these, China, Turkey, and Egypt have adopted metric units for official use, and metric units are employed in these countries to an ever-increasing extent in commerce. In China, for instance, metric units are used on the railroads, in the army, as the official measures of 28 ports, and are predominant in industry and engineering.

World trade, therefore, demands adoption of world measures. If we neglect to use these simple world-uniform decimal standards, we are imposing a handicap upon ourselves in every market. Such is the unanimous testimony of American consular officers and trade commissioners abroad. They declare that by failure to use the metric measures we are actually

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The Rose TECHNIC

A Magazine Pertaining to Engineering and Allied Sciences

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Conducted by C. M. Ploch, m., '29

SUBWAY SLIDE AT OAKLAND, CALIFORNIA

When the north shore end of the subway under the Oakland estuary at Oakland, California was under construction it was found that by some sort of chemical action the concrete had softened by asphalt waterproofing. The surface that had thus been softened slowly moved down grade approximately 6 in. By an intricate arrangement of jacks it was stopped and held in place. Then, with a change in design all possibilities of any further trouble was eliminated. But the process was not quite as simple as may seem.

The point of inferiority was on the Oakland side, the subway being somewhat the shape of a horseshoe and built on a 4.59% grade. Three layers of cotton fabric entirely surrounded the structure, forming a water-proof envelope. Hot asphalt was poured between, under and over these three so-called layers.

Then the sub-base was held 1 in. low, mainly to convenience the laborers on the job. The sub-base, incidentally, consisted of a 4 in. slab of the best concrete. The water-proofing specifications provided for a minimum of one-third of a gallon of hot asphalt per square yard of surface for each of the four moppings. The membrane, when completed, was three-eighths in. thick.

The heat of setting, near the bottom especially, was confined to the limited area of the water proofiing which had softened, forming a lubricant on the 4.59% skidway.

As for the structural part; it was without doubt of sufficient strength to hold the pour firmly to the already completed work and to prevent any further sliding after the concrete had set enough to develop a band. Briefly, it consisted of 150 bars of ¾ in. square steel, spaced on 6 in. centers along both faces. Then corrugations across the concrete sub-base slab were built; an act which prevented any slipping movement whatsoever. Since this 6 in. slide was first observed, no fatal results accrued but it had necessarily caused the engineers on the construction work much cause of worry until this slipping was entirely stopped.

DUST AND ITS EFFECTS ON LUBRICANTS

THE Bureau of Standards has recently completed a series of experiments in an endeavor to determine the effects of road dust on automobile lubricants. As explained by the department making the investigation, the work consisted of a study of the performance characteristic of journal bearings when a fine abrasive was in the lubricant. Such is a parallel case to that resulting from road dust and other foreign substances in crank case oil.

When a machine is placed under severe operating conditions, these undesirable particles in the lubricant cause a great increase in the frictional losses. So long as the loads are light, however, but little difference is noticed. Thus the lasting quality of the engine parts, from the economic and serviceable standpoints need to be determined with a great degree of accuracy, as regards the effects the dust particles will have upon them.

Journal bearing machines were used in the tests made. The frictional losses were recorded when operating under various conditions such as the speed of the shaft, load on the bearings, and viscosity of the oil. When all of this data was finally obtained, an accurate comparison of the performance of all types of lubricants with a given bearing could be computed.

The results of the tests revealed several interesting facts. Straight mineral oils and the same oil when a minute percentage of abrasive is added, showed that the losses due to friction are about the same as long

as subjected to light service. But, when more severe conditions are to be contended with, the latter oil has a much greater loss due to friction than was observed with the straight oil.

Summing up the above we see that the results of the experiment give a measure of frictional losses, show the rate of wear caused by the abrasive, and give promise that there is a great field for research with reference to the determination of all the factors affecting the wear of journal bearings.

CARBON BISULPHIDE FIRES

Of all the liquids used in manufacturing processes today, carbon bisulphide is without doubt the most dangerous of them all. For example, it may be ignited at temperatures ranging from -20 degrees F. on up. At 300 degrees F. it spontaneously ignites. Fires involving this liquid are almost always beyond control, for the ordinary methods of fire extinguishing prove of no avail. Then, in addition to this, the choking fumes given off (sulphur dioxide) make it difficult to get to the flames should there not be ample ventilation. The vapors from carbon bisulphide are explosive, a fact that makes its use in a confined area dangerous.

Naturally various methods of extinguishing the flame have been experimented with, and recently a set of research data has been compiled that gives considerable information about the liquid in regard to fire. Practical conditions were adhered to as closely as possible in that the carbon bisulphide was ignited in open tanks and attempts were made to put out the fire in practically every conceivable way.

It is known that sawdust and soda acted as good extinguisher for fire in most hazardous liquids, but when played upon this material it was found to be without effect unless added in quantities great enough to absorb all the liquid. Even the vapors penetrated the sawdust and started to burn.

Next carbon tetrachloride was tried. Again failure resulted in that a great excess was needed before it even affected the flame. In enclosed spaces, however, the tetrachloride might possibly be used.

Foaming solutions were next applied to the burning bisulphide. Any cooling effect was hardly apparent here. It is true that the severity of the fire was lessened, but on the other hand, it could hardly be depended upon as a positive extinguishing agent since the vapors of the carbon bisulphite penetrated the blanket and started to burn on the surface. The stream from an automatic water sprinkler was ineffective because of the splashing which accompanies the impact; the burning liquid is apparently forced over the top of the tank spreading the burning area over a still greater space.

With failure after failure, as already listed above, an effective method was finally found. Water flowed slowly into the burning material from a low pressure hose stream. A perforated pipe, below the surface will serve equally as well. The water, which is lighter than the carbon bisulphide and does not mix with it, must be admitted so as to eliminate all splashing; thus the slow flow. It is a blanketing rather than a cooling action that puts out the fire; the water collecting over the surface of the carbon bisulphide.

Carbon bisulphide, as the above would suggest, should rarely be used inside main buildings, all processes involving its use being preferably carried on in remote outside buildings. Perforated pipes under the tanks are practically indispensable. With such precautions, these fires, always dreaded, can be coped with very effectively.

TUNNELING METHODS IN BRITAIN

The newest type of English practice in tunneling was revealed when a single track tube tunnel was recently constructed in London. The tunnel was for a five mile extension to the present underground railway. Naturally, problems peculiar to the case had to be dealt with, but these were overcome with comparative ease. Geographically, the new line extends from Clapham to Mordfn, in the southern suburbs of the city, finishing the last one-half mile on the surface of the ground.

The tubes employed in the construction are approximately 11 ft. 9 in. in diameter and are placed about 40 ft. below the surface. These tubes are spaced at 5 ft. intervals and connected by suitable passage for workmen. Upon the approach to a station, the diameter is increased to 21 feet and the spacing lengthened so as to make way for escalator shafts between the tubes. Economy is practiced in the approach and departure of trains from each station. The cars are checked by a rising grade of 1.5 per cent, 600 feet long when approaching a station; while immediately on the other side the tracks run down grade to the extent of 3.3 per cent for 300 feet. The line so far as possible was constructed under public streets, but occasionally it was necessary to tunnel under private property. The underground surveys were practically accurate in every detail.

The work was divided into sections. Generally the portion between successive stations was considered as a section, which, as a rule, comprised a 3000 ft. stretch. The concrete tunnel consisted of two rectangular passages separated by a 12 ft. wall.

The tunneling, for the most part, was accomplished by means of hydraulic shields, erected in chambers on the tunnel lines. For successive sections one tube was started in advance, thus the two shields were never side by side. By regulating the force exerted by the several rams, the line and the grade was changed at will; however, with a uniform pressure, the tendency was to nose downward, because of the weight of the shield.

The cast iron lining rings were transferred by hydraulic erecting cranes. These rings were 20 inch. long and made up of six segments equipped with a key, except for those at stations which were 18 in. long and made up of twelve segments and a key. Holes in the segments made grouting possible. In the escalator shafts the upright joints of the segments are vertical and the longitudinal joints parallel to the general center line of the shaft.

Various materials were encountered in the tunneling, among which were shale, gravel, stiff clay, wet sand, and some soft ground. Test borings were made from the surface and likewise at the faces of the headings. These latter were made to detect water

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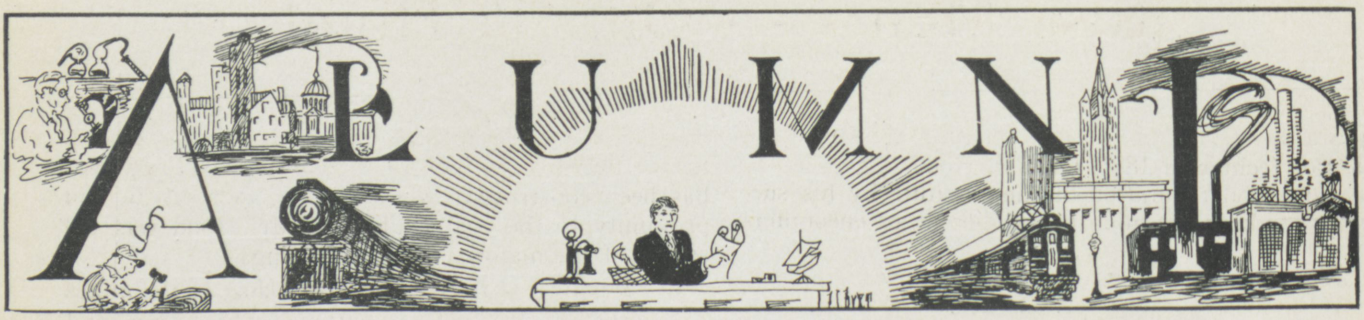


'86

Among the limited number of Rose graduates in foreign countries is Lucien N. Sullivan, who has been the American Consul at Cadiz, Spain. Recent reports from him tell of his change to Cienfuegos, Cuba, again at the American Consulate. Sullivan was awarded his Master of Science degree from Lehigh University in 1905, and his Mechanical Engineering degree from Rose Tech in 1908.

'94

James C. Holding has been promoted to Manager of the American Stainless Steel Company of Pittsburgh. He was previously president of the Premier Staybolt Company of Pittsburgh, Pennsylvania.

'02

Arthur J. Paige is with the General Motors Company of Detroit, Michigan, working on the development of Rotary Aircraft engines. Mr. Paige received his Master of Science degree in 1906 and his Mechanical Engineering degree in 1909. He received the Hemingway Medal upon his graduation.

'10

Henry M. Shaw is the Director of the Nippon Hanovia Quartz Lamp Company, Limited, of Tokyo, Japan. He was formerly with the Haroma Chemical and Manufacturing Company of Cleveland, Ohio, in the capacity of Special Factory Representative.

'11

James M. Tilley of the Illinois Central Railroad Company has been transferred to Chicago, where he is Assistant Engineer with offices in Room 706 Central Station. He was formerly Resident Engineer at Marion, Illinois.

'12

C. Owen Fairchild is Chief Research Engineer for C. J. Tagliabue Manufacturing Company of Brooklyn, New York. He was formerly Chief of Pyrometry Section, Bureau of Standards, Washington, D. C. Rose Tech conferred upon Fairchild the degree of Master of Science in 1920.

Benjamin L. Heer is the Assistant Sales Manager for the General Tire and Rubber Company of Akron, Ohio. He was formerly Manager of Hollywood Realty Company at Ft. Pierce, Florida.

'14

Thomas T. Hardman with the Foulkes Construction Company has been transferred to Pineville, Kentucky. Hardman received his Mechanical Engineering degree from Rose Poly in 1916.

'16

Elmer Gadberry is teaching in the High School at Ensley, Alabama. He formerly taught Physics at Vincennes, Indiana High School.

Morris J. McKeever who was formerly a Chemist and Metallurgist with the Lucey Manufacturing Corporation at Chattanooga, Tennessee, is now the Southern Representative for the Crucible Steel Company of America at Atlanta, Ga.

Harold E. Smock formerly a Mining Engineer at Terre Haute, Indiana, is Electrical Construction Engineer for the Hudson Coal Company of Scranton, Pennsylvania.

Ralph A. Stuart, recently a Mechanical Engineer with Shourds-Stoner, Incorporated at Terre Haute, Indiana, is a Sales Engineer for the W. P. Wittington Company of Indianapolis. The degree of Mechanical Engineer was conferred upon Stuart in 1922.

Robert A. Weinhardt with the Knowles, Taylor, and Knowles Company of East Liverpool, Ohio, as a Plant Superintendent, has been elected to vice presidency.

'20

Harold P. Kremer, formerly the Assistant Building Inspector and Computor for the City of Louisville, Kentucky, is now with the Beeler Organization of New York City, with his station at Louisville.

'21

C. Richard Voges, formerly an Instructor in Chemistry at Texas A. and M. College at College Station, Texas, has accepted a position as Chief Chemist for the Landa Industries, Incorporated, of New Braunfels, Texas.

'22

Leroy A. Wilson, has been transferred to Ft. Wayne, Indiana, from Marion, Indiana, as a District Traffic Superintendent with the Indiana Bell Telephone Company.

Ernest O. Hunt is with the G. W. Phillips dealer in Fireproof Building Products Company at Denver, Colorado. He was previously with the Truscon Steel Company of Portland, Oregon.

Deleon A. Young with the Sinclair Refining Company has been transferred to Marcus Hook, Pennsylvania from East Chicago, Illinois. He is an Experimental Engineer.

'23

Richard W. Bledsoe formerly Sales Correspondent, Supply Department of the Western Electric Company

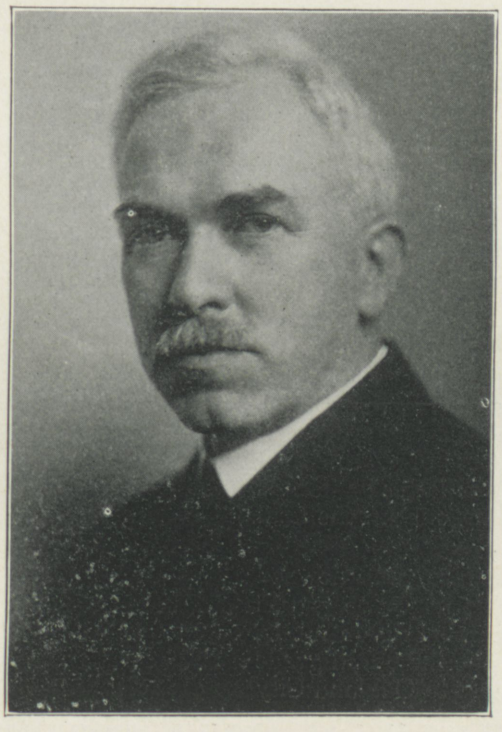
(Continued on page 20)

Rose Men - - - Onzi P. Hood

AS a member of the first graduating class of Rose Polytechnic in 1885, Onzi P. Hood has added to the name and reputation of the Institute by his success in studies pertaining to the difficulties encountered in the mines of today.

Living in Lowell, Massachusetts, where he was born June 14, 1865 Mr. Hood attended Worchester Polytechnic Institute from 1882 to 1883 completing his junior year there. In September of the same year he entered Rose Polytechnic Institute in the Mechanical Engineering course.

Upon his graduation, Mr. Hood began as a pattern maker in Indianapolis where he became Superintendent of the Royal Manufacturing Company in the following year. In 1887 he accepted a position as Superintendent of Shops of the Kansas State Agricultural College at Manhattan, Kansas. After one year in that capacity, he was made Professor of Mechanics and Engineering, which professorship he held until June, 1898. In that year he was elected Professor of Mechanical and Electrical Engineering in the Michigan School of Mines at Michigan. In the service of that Institute, Mr. Hood was afforded unlimited opportunities to carry on additional studies which greatly figured in the shaping of his future work.



ONZI P. HOOD

While in the position of Professor of Mechanical and Electrical Engineering at the Michigan School of Mines, which covered a period of thirteen years from 1898 to 1911, Mr. Hood began a practice as a Consulting Engineer. During his activity in this branch of Engineering, he became interested in the workings of the copper and iron mines throughout Michigan, and at the time of his departure from that state, he was Consulting Engineer for twenty of such mines in that state. In dealing with the conditions of mine work, Mr. Hood became interested in the problems of coal mines and the many varied problems that occur in connection with them. In return for his activity in these studies, Mr. Hood received national recognition as an able authority upon such subjects.

In 1911, Mr. Hood was chosen for the office of Chief Mechanical Engineer for the United States Bureau of Mines, which position he holds today. After his selection for that position, his interest grew towards the coal mine and their environs, and in the ensuing years he was a co-author of many Bulletins and Technical papers on scientific subjects. Out of his desire to see the problems confronting the miner conquered, he was largely responsible for the extension of the experimental apparatus of the United States Bureau of Mines. A bulk of this equipment has been constructed at Pittsburgh, Pennsylvania in proximity to the coal fields, and Mr. Hood was designer of the majority of the buildings.

In recent years, the effects of coal dust in the mines has become a problem of national importance, and in its solution, Mr. Hood has figured prominently. To carry out its investigations of the characteristics of coal dust, the United States Bureau of Mines constructed long dust tunnels for the study of wave transmission when the dust explodes. This apparatus allows the coal dust to be introduced, and when it explodes, its actions are studied. From the information secured in this manner safeguards can be provided against the danger of dust explosions in coal mines.

In 1905 Mr. Hood delivered the commencement address at Rose Polytechnic Institute which was acclaimed as one of the finest ever given in the history of the school. In October of last year, Mr. Hood presented a paper on "Smokeless Fuel" at the International Conference of Bituminous Coal held at Pittsburgh.

Among the writings of which Mr. Hood was a co-author are one entitled, "Oil and Gas Wells through Workable Coal Beds; Papers, and Discussions" which was written in 1913. Another Bulletin in 1915 was, "Gasoline Mine Locomotives in Relation to Safety and Health." A technical paper written in 1913 and entitled, "Proposed Regulations for the Drilling of Gas and Oil Wells," had much to do with any erratic drillings for gas and oil. Another technical paper published in 1919 and entitled, "Safe Practice in Using Wire Ropes in Mines" tended to induce a factor of safety for the miner. In 1922 Mr. Hood alone edited a technical paper the subject of which was "Factors in Spontaneous Combustion of Coal." This paper discussed and gave reasons and preventives with regard to fires caused by the spontaneous combustion of coal.

Rose Polytechnic Institute conferred upon Mr. Hood the degree of Master of Science in 1895 and the degree of Mechanical Engineer in 1898. He is a member of the American Society of Mechanical Engineers, a member of the American Institute of Mining and Metallurgical Engineers, a member of the American Society for the Promotion of Engineering Education, and the American Association for the Advancement of Science, of which organization he was vice president and secretary in 1912. His present residence and business location is in Washington, D. C.

ATHLETICS

BASKET FIVE HAS FAIR YEAR

Win Seven of Eighteen Games

POSSIBLY the basketball team didn't have the fortune that was expected to follow them in their work this season, but it didn't do so badly after once getting started on winning ways. A total of seven wins, as compared with eleven losses is the summary in a word or so, but that doesn't tell the whole story as there is too much else to consider.

Starting the season with an outfit that was one of Rose's best bets as an athletic group, we trimmed N. A. G. U. in a nice fashion, rolling up 32 points while holding the opposition to a total of 20 markers. The boys ran into a stumbling block in their next venture when Indiana Central University took our measure to the tune of 37 to 16. The next two games were quite odd in their makeup and fully exemplified by the scores. Meeting Huntington on our own floor we won a hard-fought tussle by a score of 33 to 30. However, in the next few days Rose ventured in the great beyond on a disastrous road trip. Oddly enough, the first opposition was Huntington. Instead of downing them again, we were submerged and outscored two to one, losing by a 56 to 28 count. The following night we got another drubbing at the hands of Manchester, 59 to 35.

Lose Five in Row

These two games started the bad luck streak of the season for we lost five in a row counting them. We lost in succession to Central Normal, Earlham and the University of Louisville by the scores of 47 to 35, 47 to 27 and 41 to 39, respectively. The latter game was one of the heartbreaking type, losing only in the final minutes of a double overtime tilt.

Vincennes, next on the bill of fare, was downed easily by a 47 to 21 score. In the next two games there was a slight replica of the Huntington affair, only that we were the ones that made the uphill grade on high: Losing by a 48 to 29 score to Oakland City in the first, we came back in the next game to win out in a hard game by a 38 to 34 summary.

The next two games were as many victories, winning from and getting a little revenge from a previous upset from Indiana Central by a 42 to 38 score. The gang repeated in the next tilt against the N. A. G. U. five, although not winning as easily, merely by a margin of four points.

Eastern Illinois handed the Rose men their second defeat when we got trimmed again by a lone point, the score being 37 to 36 at the final whistle. But we then gave Vincennes their second defeat of the year, winning 41 to 25 this time. The last two games were played on the road and both were lost. Hanover performed against the Engineers and sent our boys home with a 43 to 27 lemon. In the finale of the year we invaded Louisville with hopes of winning from the Colonels on their own floor, but the game was somewhat in favor of the Kentucky lads when the final score of 43 to 35 was registered.

Outscored by 81 Points

Reviewing the season shows that the Engineers scored 81 less points than did the enemy. A total of 675 were registered at our expense, while our five was counting 594 times. Not so bad when one considers that only seven of 18 games were put on the right side of the ledger. It shows that we could score almost on an equal basis in spite of the big odds against us.

Next year we will be blessed by almost a full representation of this year's outfit, so there is no reason why we shouldn't do a little stepping. The men will have benefited greatly, no doubt, and if there is any luck coming our way just watch the colors, Rose and White floating on the breeze.

HANOVER TEAM DEFEATS ROSE

HANOVER, Ind., Feb. 25—Hanover played a consistent game tonight and defeated Rose Poly, 42 to 27. The game started fast, with Hanover taking the lead. Many fouls were committed due to the fast playing.

Telle and Davis starred for the locals, the former getting eight baskets. Alexander and Berry were offensive stars for Rose Poly, with Reinking's guarding featuring. Hanover led at the half, 19 to 14. Score:

HANOVER (43)—	F.G.	F.T.	P.F.
Harrington, f.	1	1	4
Davis, f.	4	5	0
Whitcomb, f.	2	1	0
Telle, c.	8	1	3
Garrett, g.	2	1	3
Malek, g	0	0	2
Totals	17	9	12

ROSE POLY (27)—	F.G.	F.T.	P.F.
Alexander, f.	3	1	1
Kasameyer, f.	2	1	1
Berry, c.	3	2	0
Thompson, c.	0	0	0
Reinking, g.	0	1	1
Taggart, g.	0	1	4
Goddard, g.	2	1	3
Totals	10	7	10

ROSE GOES DOWN IN CLOSING SETTO

LOUISVILLE, Ky., Feb. 26—Getting the jump on the Engineers at the start of the game, the University of Louisville defeated Rose Poly here tonight by the score of 43 to 35.

In the second half, the Fighting Engineers attempted to stage a desperate comeback and outscored the Louisville team, making 17 points to 16. Kasameyer was late in starting his field goal shooting, getting only one in the first half, but caging four field goals in the last few minutes of play.

Rose failed to show the passing and team play displayed in other games, and long shots for the basket featured their offense in the first half. They came back and played good basketball in the last period,

but Webber's goal shooting kept Louisville in the lead. Koster with four field goals went big for Louisville in the first half, but failed to score in the last period. Berry played a good game over the floor for Rose.

Art Reinking, a senior, played his final basketball game for Rose Poly tonight. Reinking showed some good passing and his defensive work was clever. Lineup and summary:

UNIVERSITY OF LOUISVILLE, (43)	F.G.	F.T.	T.P.
Webber, f.	6	3	15
Craddock, f.	3	0	6
Libby, c.	4	1	9
Koster, g.	4	0	8
Blackerby, g.	1	1	3
Brown, f.	0	0	0
Moriarty, c.	1	0	2
Espire, g.	0	0	0
Ford, f.	0	0	0
Totals	19	5	43

ROSE POLY, (35)	F.G.	F.T.	T.P.
Alexander, f.	7	2	16
Kasameyer, f.	5	1	11
Goddard, c.	0	1	1
Reinking, g.	0	1	1
Taggart, g.	0	0	0
Berry, c.	2	2	6
Totals	14	7	35

Referee—Horne.

ENGINEERS IN THRILLING WIN

Starting the game with a caliber of defense and offense that completely bewildered the Oakland City five, Rose Poly gained a sufficient lead to stave off a game rally on the part of the downstate five during the closing period and won, 38 to 34. This victory for the Engineers avenged the defeat sustained a week ago tonight at Oakland City.

From the opening play until the whistle sounded ending the first period, the Engineers were masters of the game. All of the five Rose men seemed to be on their toes in this period, which resulted in nearly an airtight defense, with an offense that displayed speed and accuracy. So nicely was the Rose offense and defense working at the first of the game that 12 minutes had slipped by before the visiting team had scored a point. They were given several opportunities to score foul goals but could not produce.

Oakland Scores

Oakland City scored its first point with a successful free throw and followed up with a field goal soon after. This seemed to give them a start and they began a gradual climb that netted them 12 points at the half period. The Engineer teamplay had not weakened during this time and they were still 10 points in the lead at the half. The Rose Poly offense was particularly good in the first half as is shown by their 10 field goals during that time. The defense of the local five showed its wares by keeping the Oakland City forwards to four field goals in the first half.

Kasameyer led the scoring for the local five with eight field goals. Alexander was not far behind with six goals, while Keller and Young were next with 11 points each. Rose Poly set a good pace at the beginning of the game and kept that up until the end. Oakland City began rather slowly, but improved on their style until the final gun. Lineup and summary:

ROSE POLY—	F.G.	F.T.	T.P.
Kasameyer, f.	8	0	16
Alexander, f.	6	0	12
Berry, c.	0	2	2
Goddard, g.	3	0	6
Taggart, g.	0	0	0
Reinking, g.	0	0	0
Thompson, f.	1	0	2
Totals	18	2	38

OAKLAND CITY—	F.G.	F.T.	T.P.
Fisher, f.	1	1	3
Turner, f.	1	0	2
Young, c.	4	3	11
Couts, g.	0	1	1
Decker, g.	1	0	2
Keller, f.	4	3	11
Sanders, g.	2	0	4
Totals	13	8	34

Referee—Russell.

ROSE FRESHMEN WIN

The Rose Poly Freshmen easily displayed their best basketball of the season by taking the Fulper Signs into camp in a curtain-raiser contest, 27 to 21. The Rhinies opened the game with a good, fast pace which they were capable of maintaining until the end. They got into the lead with the first point scored in the game and were never headed throughout.

Fisbeck, as forward for the Fulper Signs, led the field in the scoring with four field goals and three foul goals. Moore, for the freshmen five, followed with five foul goals and one field goal for a total of seven points. The remaining field goals made by either team were well distributed. Rose Poly was leading at the half by a score of 16 to 13. Lineup and summary:

RISE FRESHMEN (27)—	F.G.	F.T.	T.P.
Rockwood, f.	1	2	4
Alexander, f.	2	1	5
Zimmerman, c.	2	1	5
Davy, g.	0	0	0
Gibbens, g.	0	0	0
Hill, f.	1	4	6
Moore, g.	1	5	7
Marsh, g.	0	0	0
Totals	7	13	27

FULPER SIGNS (21)—	F.G.	F.T.	T.P.
Fisbeck, f.	4	3	11
Cusick, f.	2	0	4
Kadel, c.	1	2	4
Marshall, g.	0	0	0
McGinn, g.	0	0	0
Ballinger, f.	0	0	0
Crichfield, f.	1	0	2
Totals	8	5	21

Referee—Piker.

KASAMEYER LEADS LIST OF SCORERS

Alfred Kasameyer played a great game this season and in spite of his smallness he was the high point man of the outfit. Starting his uphill fight late in the season, he was able to pile up a lead that placed him at the head of the list with some 57 points to the good. Captain Berry and Goddard put up a great race for second and third positions, with the honors going to Berry by a slim margin of two points. The other men of the Engineers sharpshooting list were more

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FRATERNITIES

THETA KAPPA NU

INDIANA Gamma of Theta Kappa Nu enjoyed a well attended Pledge Dance at the Edgewood "Log" Cabin last February 26th. Brothers Sherwood, Watkins, Trigg, Patton, and Balsley were the alumni present and six of our brothers of the DePauw chapter were guests for the dance and dinner the following day. Prof. and Mrs. O. L. Stock and Dr. and Mrs. C. P. Sousely acted as chaperones while the music was furnished by Ada Campbell's orchestra.

We are very pleased to announce the pledging of James C. Proctor of Indianapolis, Indiana. This makes a total of fifteen Freshmen pledges for this term.

During the week beginning Monday, March 7th, the pledges will be given the opportunity to prove their real merits as men among men. This opportunity will be extended to them during this week which is commonly termed "rough week." A huge house party of the "rough and ready" type will culminate "rough week." At this party the forty-odd members of Indiana Gamma, together with their lady friends, will celebrate this chapters many successes.

The formal initiation of all of the pledges is to be held on Sunday morning March 13th at 9 o'clock at the fraternity house. Following the ceremonies, dinner will be served and the afternoon will be employed in making merry and affording to each member an enjoyable time.

SIGMA NU

PLANS are being made by Beta Upsilon to attend the state dance to be held in Indianapolis, March 26, 1927, which will be held in conjunction with the Hoosier Rally. One of the originators of the Hoosier Rally was Brother Trafford Talmadge from this chapter, and every year the local chapter has had a large representation.

The Hoosier Rally is a gathering of the Sigma Nus in Indiana held once a year at Indianapolis for the purpose of discussing the affairs of the fraternity in this section of the country of which the greater part is covered by the fourth division. The usual program includes a banquet, which is the nucleus of the Rally, business sessions, and a dance.

Each chapter is customarily called on for a stunt to be given at the banquet, and with the many nut and bolt idealists in the Sigma Nu chapter at Rose Poly, we should not have any great trouble making a show.

The pledge dance was held at the chapter house, Saturday night, February 19, which completed the affairs of welcome to the new class of freshmen. Ada Campbell furnished the refrains that encouraged the youthful aspirants of the Terpsichorean art to their utmost in the ballroom antics of today, namely the Black Bottom, and the innumerable hops. A light lunch was served near the middle of the jubilee which only hindered the guests from dancing a few minutes. At an appointed time, unknown to the feminine guests, the members gathered together for the singing of the fraternity songs, which was topped off by a wind storm, typical only to the Rose student.

Beta Upsilon was very much honored to have the opportunity of entertaining Ernest Lee Williams, the General Secretary of the Sigma Nu Fraternity, on Wednesday, February 9, 1927. With "Dad" Williams came Ellis B. Hall, the inspector of the fourth division.

Brother Edward Hauer of Chicago, Illinois, was a recent visitor to the chapter house, this being his first opportunity to survey the new location.

THETA XI

AN informal party at the house was enjoyed by the members of Kappa of Theta Xi on the evening of February 21. After the Rose-Vincennes game the brothers and their dates congregated at the house, where bridge, dancing, etc. was the program of the evening. Brother Kadel and his banjo was in great demand during the evening and much harmony (?) was enjoyed.

Kappa's annual pledge dance will be given at the house on the evening of March 5. The house will be appropriately decorated with oak, hickory, etc. This dance gives promise of being a very successful affair.

Kappa was visited during the week by honorary brothers Warner and Lewis.

ALPHA TAU OMEGA

ON the week end of February 12, the Delta Rho chapter at Bloomington, Indiana acted as host for all the Indiana chapters of A. T. O. at the second semi-annual conclave of Province XVII. Among the motions completed at the session was that of the plans for holding the State Banquet and Ball. This important event will take place March 12 at the Hotel Lincoln in Indianapolis. All the brothers of Gamma Gamma are looking forward to this annual event, and to the pleasure it holds in store for them.

Between halves of the Rose-Vincennes U. basketball tilt played at the Rose gymnasium February 21, two of Gamma Gamma's men were rewarded for the work they had done on the gridiron last fall. Brothers Booth and Sawyers were the recipients of Rose letter-sweaters at that time.

On Sunday evening of February 12 our "Frat" house was the scene of much fun and brotherly co-operation. The event was an open house party which was so successful that it was generally agreed to instigate several affairs of the kind in the future.

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Fraternities

(Continued from page 18)

ALPHA CHI SIGMA

IOTA chapter wishes to announce the pledging of Emil Krockenberger '29, and Emery Swander '30.

Iota held its annual pledge banquet Friday, February 18, in the banquet room at the Elk's club. Among those present were Dr. White and John Sanford. Brother Sanford '15 in his inimitable way acted as toastmaster and challenged a number of those present. Very interesting talks were given. Following this, a general round table discussion took place. The party broke up at a late hour.

On February 21 Iota was honored by a visit of its District Deputy, H. E. Wiedeman '03 who is Consulting Chemist in St. Louis. A pleasant "session" was held at the home of H. P. Shewmaker at which Bro. Wiedeman unearthed many interesting incidents of his schooldays. In those days the Chemical Engineer was barely known—in fact the profession was in its cradle, so to speak. Wiedeman also told of interesting experiences during his early professional career. The meeting did not break up until the "wee hours."

The monthly professional meeting was held at the home of K. Metcalf on February 28. Professor Child was present and delivered an interesting review of Chemical Engineering courses in other enginering colleges. Courses at U. of Minnesota, Massachusetts Institute of Technology and Columbia University were principally considered, together with salient details of courses in other institutions. A period of open discussion and fellowship followed.

Alumni

(Continued from page 14)

at Chicago, Illinois, has been transferred to Milwaukee, Wisconsin.

James B. Connelly who is in the employ of the Kentucky Actuarial Bureau has been transferred from Louisville to Pineville, where he is Branch Manager.

John J. McCormick who was previously with the Commercial Solvents Company at Terre Haute as an Analytical Chemist, is now with the O'Brien Paint and Varnish Company of South Bend, Indiana.

Jesse L. Tygart, once with the Missouri, Kansas, and Texas Railroad at St. Louis, Missouri, is now a Salesman for the Bethlehem Steel Company at Cleveland, Ohio.

'24

Richard I. Graul is Inspector for the Electric Bond and Share Company of New York and is at present stationed at Baltimore, Maryland.

Maurice R. Loser is a Chemist for the Youngstown Sheet and Tube Company at East Chicago, Indiana. He was formerly an Analytical Chemist, Experimental Department of the Sinclair Oil Company of the same city.

'25

Zachary X. Bennett, who is in the employ of the Marion Steam Shovel Company has been transferred from New Orleans to Jackson, Mississippi.

Reproduction of two-page Timken Advertisement in The Saturday Evening Post

Railroad trains running on Timken Bearings represent the most significant development in the history of friction elimination. When you realize that Timken-equipped trains can be started with only *one-eighth* of the power formerly needed, and that the old hot box dangers are gone, you begin to sense the meaning of this latest Timken achievement.

For a long time Timken has been approaching this climax. Timken Tapered Roller Bearings have become universal in motor vehicles. They have swept industry, being used in machinery of every type, sponsored by the most highly reputed engineering institutions. In Transportation, Manufacture, Mining, and Agriculture Timken Bearings identify the most modern designs of the most progressive equipment manufacturers.

It is certain that engineers of every class will be increasingly concerned with the greater mechanical endurance and operating economies made possible by Timken Tapered Roller Bearings.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

Every Engineering Department should have the highly informative Timken Engineering Journal—110 pages broadly covering modern bearing practice. Faculty members may have a copy upon request.

Metric Standardization

(Continued from page 11)

losing much trade which would otherwise be ours. Virtually every Chamber of Commerce abroad has urged the United States to adopt the world decimal standards. In Latin America, the Orient, Europe, Africa, and virtually every field of trade, the value of the metric measures is apparent. Even in our trade with the British Isles and British possessions the continued use of our present system of units does not avail us an advantage, in fact our trade with the British is hampered (not aided) by our having units with similar names to theirs, but with unlike capacities. Our weights and measures are vastly different from those of the British, and this causes unending confusion. Thus our petroleum trade with Great Britain is in gallons that are not British gallons; our vast trade in grain is in bushels that are not British bushels.

Even the British who have long remained in the background regarding standardization in industry, have awakened, and present intimations are that they will vie with the United States for the distinction of first standardizing on the world metric units. Only lack of co-ordination of activity has kept Britain lagging at the end of the decimal processional. In regard to our world trade and the need of metric standardization Hon. Herbert Hoover, United States Secretary of Commerce, declares: "It may be well put forth as a truism that it is impossible to maintain proper standards of ethical contact throughout business and industry without proper standards of quality and quantity. In order that international good will may be maintained and the interests of the individual and the public be safeguarded, it is necessary to establish standards of quality and quantity in such commodities as enter into international trade." The metric units are the international quantity standards.

Engineering Bodies Favor Metric Measures

Engineers are overwhelmingly in favor of the decimal metric measures. Typical of their view was the vote of the American Society of Mining and Metallurgical Engineers, a decisive metric victory.

The American Institute of Electrical Engineers a number of years ago took a vote on the adoption of the metric system, and the final vote was announced as 1569 in favor, 178 opposed. No doubt at this time with the teaching of the World War and the further entry of the United States into world affairs, the vote in favor of metric measures would today be even more decisive.

The Institute of Radio Engineers, the American Institute of Architects, the American Railway Bridge and Building Association, the Associated General Contractors of America, the National Association of Electrical Contractors and Dealers, the American Institute of Chemical Engineer, the American Electrochemical Society, and many other organized groups of engineers, are urging metric standardization for the United States.

False statements have been circulated as to the position of the American Societry of Mechanical Engineers. This great organization has declared itself not opposed to metric standardization, and two of its

outstanding presidents, Fred J. Miller and Jesse Merrick Smith, are eminent metric advocates, as was that revered industrialist, John A. Brashear, another president of the American Society of Mechanical Engineers.

The Cost of Progress vs. the Cost of Lagging

We have the experience of scores of great nations to guide us in judging the slight expense and slight inconvenience incident to the transition to the world measures. In the United States the cost of transition, under the wise and liberal provisions of pending metric legislation, will indeed be infinitesmal in comparison to the benefits whch will immediately accrue. The real cost to the nation is the cost of lagging, the terrible toll in waste of time and mental effort, in misunderstanding and ambiguity, incident upon our retention of an antiquated weights-and-measures jumble. As the Secretary of the American Chemical Society, Charles L. Parsons, concisely phrased it, "If cost were an argument we should still be riding buggies while the rest of the world would be using automobiles."

One of the world's foremost authorities on the use of weights and measures, Samuel W. Stratton, President of the Massachusetts Institute of Technology, and for 20 years Director of the United States Bureau of Standards, emphasizes the ease of transition to the metric standards in merchandising: "I think the question of expense has been very greatly exaggerated, due to a misunderstanding of what would be required or what the manufacturers would have to do in case the metric system was adopted. In those countries where the metric units have been adopted, the laws which have been enacted have referred to commerce and trade, and I think that is what we have in mind when we speak of the adoption of metric units here. The use in manufacturing has been gradual and has been left largely to the interests involved." In line with this same point, it will be remembered that during the war our industries turned out many thousands of orders for foreign nations on a metric standards basis. This shows that industry would be able to adopt the metric units whenever it sees fit. The present movement is only applied to merchandising—manufacturers will continue to use any weights and measures they desire in production. But after 1935, as has been proposed, all buying and selling will be in terms of metric standards.

Embryo Engineer (punching rabbit vigorously): "How much is two and two?"

Kindly Old Man: "Son, what do you mean by punching that rabbit and yelling, 'How much is two and two?' "

E. E.: "I'll punch it all I want to. My father said rabbits multiply rapidly and I can't even get this one to add."

"I'm going to marry a pretty girl and a good cook."

"You can't, that's bigamy."

On a farm in South Georgia is posted this sign: "Trespasser's will be persecuted to the full exten of 2 mean mongral dorgs which ain't never ben ovarly soshibal with stranger's and 1 dubble barrel shotgun which ain't loaded with no sofy pillers. Dam, if I ain't getting tired of this hel raisin on my proputy."

She: "I don't like all these flies in this room."

He: "Well, pick out the ones you like and I'll shoo the rest of them away."

To Their Lights

One: "When I was in college I studied math. and now I have a job with a dentist extracting roots."

Two: "When I was in college I studied fishery and only yesterday I got canned."

Tourist: "I clearly had the right of way when this man ran into me, and you say I was to blame."

Traffic Cop: "You certainly were."

Tourist: "Why?"

Traffic Cop: "Because his brother is chief of police, his father is judge, and I'm going to marry his sister."

He: "Do you think you could live on $40 a week?"

She: "Sure, but what will you do?"

The Old Story

Son (nervously): "After all, Dad, the real thing in college is the social atmosphere. The real values lie in the social opportunities and—"

Dad (taking our check book): "What did you flunk this time?"

One time there was a family of polecats living in a den. One day a dog came by and found the den. The baby cats became frightened and ran to their mother and said, "Oh, Mother what shall we do?" The mother calmly replied, "Let's pray, my dear children."

"Why have they postponed McGinty's hanging again?"

"He has a boil on his neck."

"Yeah?"

"And they were afraid the chafing of the rope might cause infection to set in."

E. E.: "'Watt reaction do you get from your 'ohm' brew?"

E. E.: "Oh, a 'load factor' of about seven per cent, but it doesn't 'phase' me."

Power Plant Poetry

Sing a song of nuts and bolts
Of rivet head and screws;
Entertain your engineer,
He's got those slide rule blues.

Politics

Bones: "Last night when I got home my wife had my easy chair all ready, my slippers at hand, my newspaper and my pipe—"

Beans: "How did you like her new hat?"

The meanest man we know is the warden who put a tack in the electric chair.

"What are you taking those cuspidors home for?"

"I'm taking them home to my dog."

"What kind of a dog could that be anyway?"

"A Spitz."

Passenger to Motorman: "Can you go any faster than this?"

Motorman: "Sure I can, but I have to stay with the car."

Prof.: "Can you give me a more elegant rendering of the sentence, 'The sap rises'?"

Student: "The boob gets out of bed."

Little boy: "May I come in your yard and get my arrow?"

Neighbor: "Yes, where did it fall?"

Boy: "I think it's stuck in your cat."

Head Barber: "Well, Tony, you're late for work again. Wotsa big idea, huh?"

Tony: "Boss, itsa like this. I starta shave before I leave da house. And firsta theeng you know, I talk myself into a shampoo and a massage."

Nut: "They are a well matched pair."

Meg: "How's that?"

Nut: "He snores and she's deaf."

The Cement Mill as a Load and Power Producer

(Continued from page 5)

the velocity is parallel to the tube. Dust should here seal the interstices but it does not and cutting is here particularly vicious.

The waste heat boiler is peculiar in that it takes heat as it gets it from the furnace that is primarily controlled with the object of making cement clinker. As a consequence there are conditions giving rise to secondary combustion and explosions, and in spite of explosion doors, these result in leaky boiler settings and consequent loss of boiler efficiency. The obvious remedy is a steel casing which will prevent air leakage that supports secondary combustion to begin with, and burn coal in the furnace. Figure 6 is a typical arrangement of waste heat boiler installation shown in connection with a Cottrell dust collector.

There are two possible arrangements of connecting the boilers to the kilns, the first where an individual boiler serves each kiln, and second where the gases of the kilns feed to a common gas chamber which in turn connects to one or more boilers.

If the installation is to be applied to an existing plant, the space conditions and number of kilns dictate the method of making this connection. For example, in a plant having 14 kilns a common flue is out of question for the reason that the regulation of draft on the individual kilns becomes a matter of gas flow in the common flue, causing erratic performance of the kiln. On the other hand, the individually connected boiler means a loss of output from the kiln when the boiler is down for repairs. However, nicety of draft control is essential to good kiln operation and it is not altogether certain that the individual boiler per kiln in spite of its handicap is not the ideal arrangement for the reason that ordinarily the boiler and kiln repairs may be synchronized. Better than discussion is actual operating data of our 14 kiln Mill No. 6 at Buffington, Indiana, operating with individual boilers. The difference in percentage of operating time before and after boilers were installed is about 1% which we feel is more than compensated for by the increased output due to the definite and individual draft control for each kiln, for it must be remembered that each kiln like any furnace has an individuality that cannot be catered to by a common flue system.

Concerning the dust in gases not arrested by the boiler, this of course passes on with the gas and is collected by a Cottrell Precipitator. In order to properly impress the idea that the waste heat boiler is really a special problem we might add that the precipitator returns to the system something like a ton of raw material duse per hour per kiln.

There is nothing especially novel about the remainder of the power station. The desirability of being connected with another power system to take the excessses of power generated and as a source when momentary shortages occur is of course obvious as is the turbine regulation which is governed by the steam supply and not by the load.

Nothing has yet been said about cost of energy generated from by-product heat. Results published concerning other installations put the upper limit of

cost per K.W. hour as .75 cents. It is indeed a poor installation or operation that cannot equal this.

While we have used the greater part of our space in descriptive matter, this was necessary in order to lead logically to certain conclusions with which we wished to impress you. These may be summarized as follows:—

The Dry Process rotary cement kiln of dimensions as commonly installed in the newer mills may be operated at a point not far from its ultimate fuel efficiency and due to the inherent inefficiency of the process rejects sufficient heat to make the installation of a boiler to recover this energy a necessary part of the cement kiln provided energy cannot be purchased for considerable less than .75 cents per K. W. Hour and sufficient for the power requirement of the whole mill. The whole question then becomes altered in that the boiler adjunct becomes subject of study in an application that is very special, more so than the kiln itself.

These conclusions are given only after reviewing nine years of operating data. Anything much less would not permit us to make such statements in view of the importance of the kiln as a cement mill unit, and the trying conditions under which the waste heat boiler has to operate, particularly in our mills. Any heat exchanger or other device installed as an adjunct to a kiln must necessarily undergo a similar period of development under working conditions before it can be accepted as good practice.

A by-product power installation being secondary in the operation of a cement mill, any error in judgment once installed may take a long time to remedy. So long as things go fairly well, engineering faults are looked upon as of academic interest. This makes the experiment under working conditions, the only definite means of solving matters of this kind, a matter of patience.

Athletics

(Continued from page 17)

or less down the list when compared to the first three, but their points were just as well earned and did as much good.

The complete list of scorers and points garnered are as follows:

PLAYER—	Games	F.G.	F.T.	T.P.
Kasameyer	18	71	25	167
Barry	18	38	34	110
Goddard	18	44	20	108
Alexander	9	37	16	90
Thompson	13	23	8	54
Taggart	18	12	8	32
Reinking	13	4	7	15
Moore	4	2	5	9
Sawyers	7	2	1	5
Franzwa	5	0	4	4
Dean	2	0	0	0
Todd	1	0	0	0

Policeman (with prisoner): "Your honor, this man was caught picking pockets at the circus."

Judge: "Ten dollars fine."

Policeman: "Your honor, he has only five."

Judge: "Then turn him loose till he gets the rest."

Astonishing, isn't it, how old, useless habits cling. For instance, a woman will still pull up her skirt when she sees a mouse.

Research and Progress

(Continued from page 13)

bearing strata and ground conditions ahead of the shield. A rotary excavater served in soft and wet ground where compressed air was used instead of hard labor. The machine consisted of a steel shield equipped with twelve hydraulic jacks around its circumference. At the middle was a motor driven shaft having six arms, each of which carried a cutter blade and a bucket to receive the material removed by the cutter. Belt conveyors carried the muck into discharging hoppers and thence to small cars. The usual working pressure was from 15 to 18 lbs.

HOW "HARDWARE" IS REMOVED FROM NEVADA'S ROADS

A STRIKING example of the dependence of one industry upon another for ideas and methods was recently demonstrated when the Nevada State Highway Department utilized electro lifting magnets to pick up nails and spikes from the highways. The idea was borrowed from the metallurgical industry without a single alteration.

Two 22-inch lifting magnets, purchased from The Electric Controller and Manufacturing Company of Cleveland, Ohio, were utilized. These were suspended between the front and rear wheels of a five-ton truck, at a height of five inches above the surface of the roadway. Current for the magnets was furnished by a 5-kilowatt direct-current, 115-volt generator which was carried in the truck body.

The magnets were given a test run over an old railway grade that is being used temporarily as a highway between Reno and Lovelock. Maintenance operations on this grade had caused the track spikes to come to the surface thereby continually causing punctures and ruining tires.

On this 100-mile section in one round trip 1370 pounds of nails, spikes, and scrap iron were picked up. An examination of the scrap material disclosed the startling fact that on this section there was a per-mile average of 45 pieces of sharp pointed metal on the roadway surface just waiting an opportunity to puncture and possibly ruin the tires of guileless tourists.

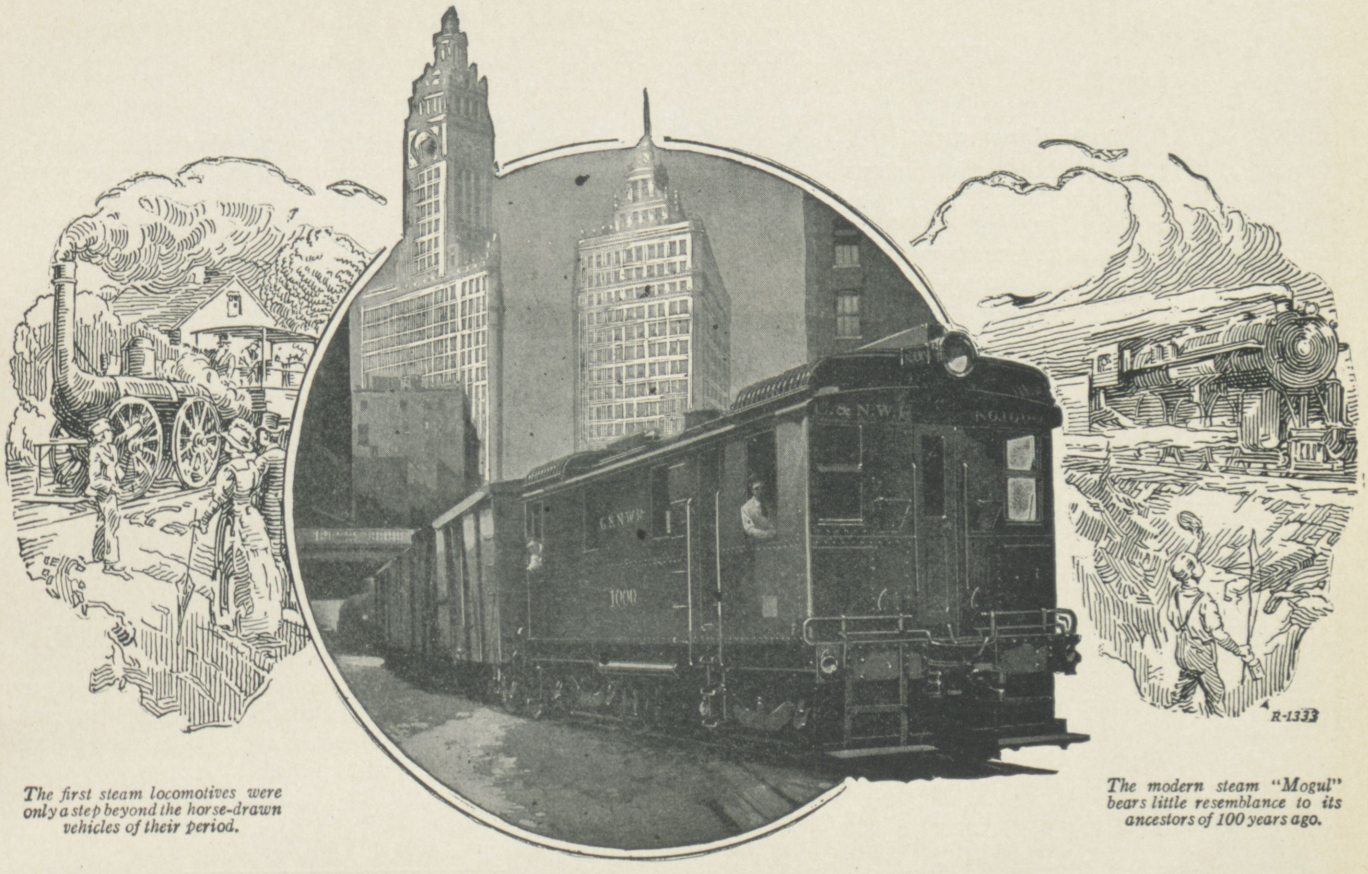
After such remarkable success on the Reno-Lovelock Road, the magnets were used to clean the streets in Carson City, where 4850 pounds of nails were picked up in two days. It is planned to keep the magnets in continual operation until all state highway routes and unimproved streets in cities on these routes are free from nails.

Constructing Concrete Bridges

(Continued from page 7)

controlling the water used in the mix, and varying the proportions of sand and stone, instead of making the concrete by the old "hit or miss" method. And also, that by using 4700 additional bbl. we obtained, with proper mixing, concrete over 32% greater in strength.

With the necessary information and an inspector or engineer who takes an interest in his work, there is nothing especially difficult about designing a concrete mixture. Furthermore, after it is designed and made there is nothing unusual involved in placing the material in the forms. Efficiency in making the sieve analysis and slump tests is easily acquired and if the inspector possesses the "concrete sense" he soon begin to undertand what it is all about and why, and is then able to make the necessary adjustments in proportions, as occasion demands. It is not necessary, if one has confidence in these methods, to make test specimens, but after all, there probably is as much justification for making them, if the principle of concrete mixture design is accepted, as there is for analyzing and testing each heat of steel at the mills. It is quite a satisfaction to know the actual strengths obtained, and the expense is not great where a laboratory is available.



The first steam locomotives were only a step beyond the horse-drawn vehicles of their period.

The modern steam "Mogul" bears little resemblance to its ancestors of 100 years ago.

An Industrial Pace-Maker

THE last century has witnessed American transportation grow from a modest stripling into a full-fledged giant with more than his share of responsibilities. Regarded with skepticism a hundred years ago, this unpromising infant has gradually welded the country into an industrial unit that has no peer the world over. And he is only just beginning!

As a matter of history, the interval between the earliest and the most recent developments in railroading is not so great. To be sure, there is a vast mechanical difference between the "Tom Thumb" of 1830 and the massive locomotives of our own inventive age. But the "Puffing Billies," the "Tom Thumbs," the "Stourbridge Lions" were, in their day, advance agents of steam locomotion—ancestors of the modern engines that now haul some two-score cars with perfect ease. They were ancestors, too, of the powerful oil-electric, with its low-cost fuel, quiet operation, and unrivalled flexibility under varying loads.

Briefly, the oil-electric locomotive is one in which an Ingersoll-Rand engine operates a high-capacity generator, the latter furnishing power to several electric motors. By the adaptation of its oil engines to railroad uses, Ingersoll-Rand Co. has again contributed to industry, and has sponsored an idea which is as sound in principle and application as the I-R developments of other years.

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Commercial Aviation in the United States

(Continued from page 10)

Department, the other the South Western Route, from Chicago to Dallas and Fort Worth, operated by the National Transport. Mr. William P. McCracken has been appointed Assistant Secretary of Commerce under Hoover and will be in charge of civil aviation.

Although the air mail service has demonstrated to the American public that service between far distant points can be supplied by airplane with regularity, speed and accuracy, it has been maintained at a financial loss for the purpose of opening up air transport routes.

Planes Show Superiority

In the year 1926 there were at least six big airplane companies operating commercial airplanes. Ford planes operating daily between Detroit, Chicago and Cleveland, have maintained a schedule accurately and without a single accident. One plane leaves Chicago at 9:30 A. M. and arrives at the Ford Airport at Dearborn, 260 miles distant, at noon. A second plane leaves Dearborn at 1:30 P. M. and is in Chicago with its load of freight at 4 P. M. The Cleveland plane leaves Dearborn at 11 A. M. and arrives in Cleveland at 12:30 P. M. It leaves Cleveland at 2 P. M. and is back in Dearborn at 3:30 the same day. Each plane carries 1,000 pounds and could carry 1,500 pounds besides the fuel, oil and pilot.

The Florida Airways Company, using Ford all-metal planes and operating on regular schedules between Fort Meyer, Jacksonville and Tampa are winning Florida and the South to airplane service. As soon as they obtain a fleet of Ford multiple planes they will be able to operate over the Florida Everglades in safety.

The Western Express Company links Los Angeles with Salt Lake City by their express planes that cover this distance in less than 12 hours, while the fast express trains make the trip in 27 hours.

The National Air Transport Company operating ten planes between Dallas and Chicago has been granted a government contract to carry mail between those cities. The government has also offered a contract to the Colonial Airways Company, and that concern now carries mail between New York and Boston according to a schedule.

The main obstacle which commercial aviation will have to overcome is the fear of the public in backing the new project, but commercial aviation is here to stay, and as the government mail planes and those of the more forward air transport companies prove that schedules can be maintained with accuracy and a minimum of accidents, it will grow with leaps and bounds.

He: "Your husband looks like a brilliant man. I suppose he knows everything."

She: "Don't fool yourself. He doesn't even suspect anything."

Swimming instructor: "Hey you—did you take a shower?"

Frosh: "No, is there one missing?"

Hale: "Back from Florida, eh? How are you?"

Dale: "Deaf."

The Road to Wealth

An engineer started his career twenty years ago as poor as the proverbial church mouse. He has now retired with a fortune of $50,000.

This fortune was acquired through economy, conscientious effort to give full value, an indomitable spirit, and the death of an uncle who left him $49,999.50.

"Should a man propose to a girl on his knees?"

"Either that or she should get off."

"I've been reading statistics—every time I breathe a man dies."

"Gosh, man! Why don't you use Listerine?"

"Why did you tip that boy so handsomely when he handed you your coat?"

"Well, look at the coat he handed me."

He harnesses words to help sell electricity

E. L. Andrew

"Oh, St. Patrick was an engineer," lustily caroled the senior engineers at Wisconsin in the spring of '16. But to E. L. Andrew, St. Patrick has become the patron saint of merchandising and advertising as well.

Andrew liked engineering and had an excellent record in his work. But even in his high school days, he had been interested in writing. And that interest grew as he wrote for the annual, was successively editor and business manager of the Wisconsin Engineer, and was advertising manager of the Engineers' Famous Minstrel Show. He received his degree fully determined to harness words to help sell electricity.

At that time railroad advertising fascinated him. There was romance—and adventure—in the great tangle of tracks spread across the continent. So he applied and was accepted for a place in the Westinghouse Graduate Students' Course, hoping some day to do railroad advertising.

A month after he started the course he was made an instructor. For six months he had classes in the morning—then was free all afternoon to browse through the Westinghouse plant and learn those things that have made him valuable in the direction of Westinghouse advertising. But that's getting ahead of the story.

"What's the future with a large organization?" That is what college men want to know, first of all. The question is best answered by the accomplishments of others with similar training and like opportunities. This is one of a series of advertisements portraying the progress at Westinghouse of college graduates off the campus some five—eight—ten years.

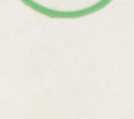
Andrew left the educational department to be a requisition clerk handling requests for literature on Westinghouse irons, fans, toasters, percolators. Here he got his first glimpse of merchandising electrical appliances—an activity that was soon to rank with railroad electrification, marine engineering and the other important branches of the Westinghouse business. Andrew grew up with this development. He was one of the men who organized the merchandising section of the advertising department, which has remained under his charge since that time.

But his activities have been wider than this. Because of his understanding of both electricity and advertising, he was made assistant to the advertising manager, giving particular attention to national advertising. With the growth of the merchandising department, sales promotion also came under his charge.

Today he is manager of the sales promotion section of the merchandising sales department, head of the merchandising section of the advertising department, and assistant to the advertising manager.

To engineering graduates interested in technical writing and advertising, Westinghouse offers an opportunity for realizing ambitions to the full.

Westinghouse

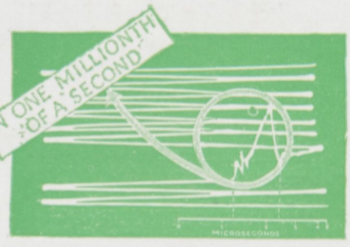


When lightning seems as slow as a glacier

It is easy to photograph a glacier because it moves but a few feet a year. But to photograph the effects of lightning on electric circuits—effects that come and go in millionths of a second—would seem impossible. Yet there is a man-made machine operated in the laboratories of the General Electric Company that does just this. It makes even lightning seem slow.

In the machine a swift-moving stream of electrons flashes across a photographic film. It dances out of its path when the freakish currents, caused by lightning, surge along the wires. There on the film is the footprint of lightning.

It has made possible a study of the working of a lightning arrester—the ingenious device that protects the costly equipment of the power house as well as the very lights in your home.



Above is one of the photographs—oscillograms they are called. The jagged curve is produced by the lightning. The surge traveled at the rate of thirty miles a second but it was recorded, and in the amazingly short time of one-millionth of a second.

Upon such scientific achievements as the cathode-ray oscillograph—lightning's camera—is the confidence in General Electric equipment founded. Many of these achievements are better known. The modern developments in x-ray, the service that has made MAZDA lamps a staple of commerce, the modern small motor that has taken drudgery out of household work—these are some of the milestones of progress.

610-19DH

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK